

The Leafhoppers of Minnesota

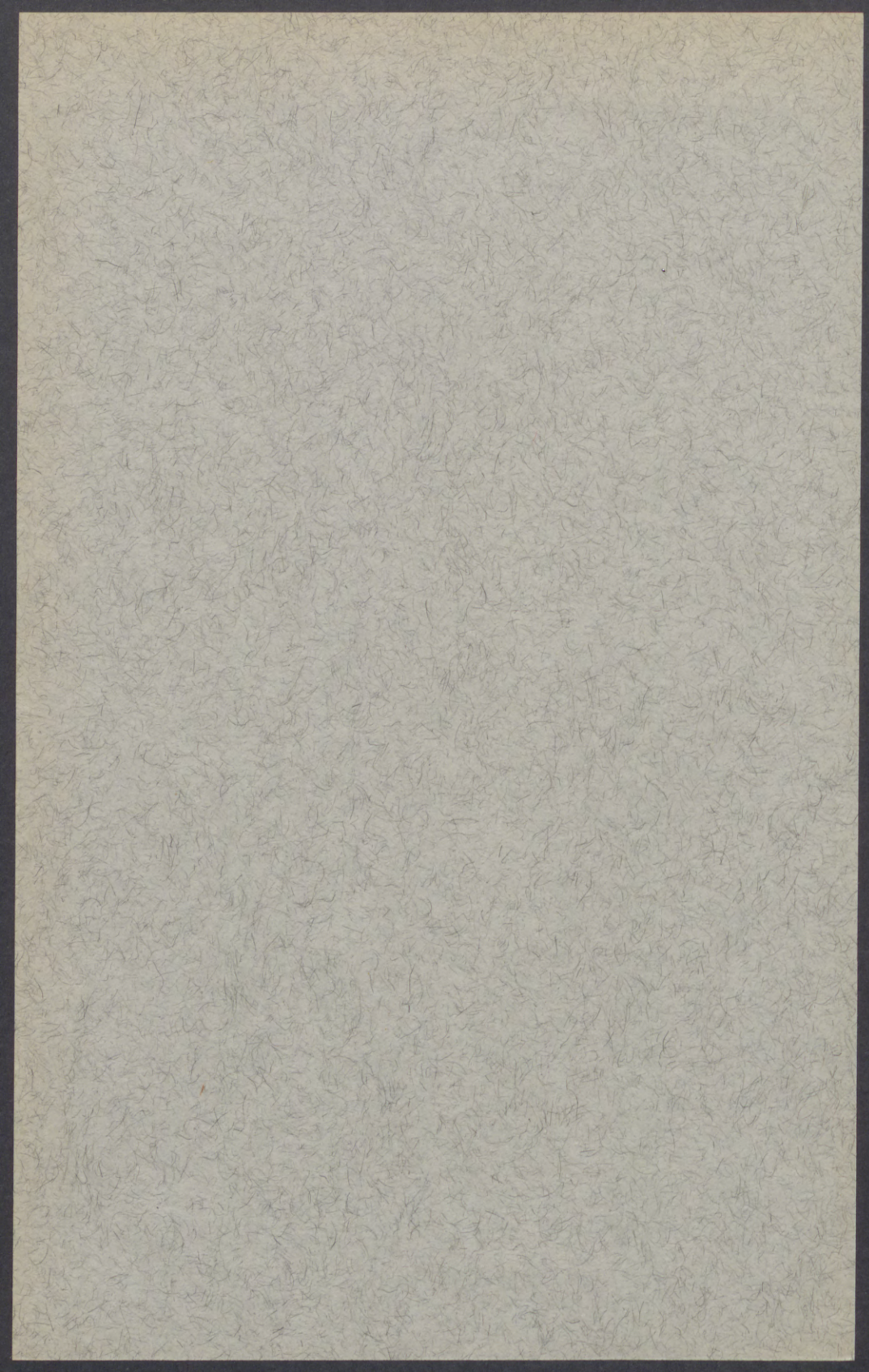
Homoptera: Cicadellidae

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John T. Medler

INTRODUCTION

THIS bulletin attempts to present as accurate and complete a guide to the leafhoppers of Minnesota as possible within the limits of the material available for study. It is realized that certain groups could not be treated completely because of the lack of available material. Nevertheless, it is hoped that in its present form this treatise will serve as a convenient and useful manual for the systematic and economic worker concerned with the forms of the upper Mississippi Valley. In all cases a reference to the original description of the species and genus is given. Keys are included for the separation of species, genera, and supergeneric groups. In addition to the keys a brief diagnostic description of the important characters of each species is given. Extended descriptions or long lists of references have been omitted since citations to this literature are available from other sources if actually needed (Van Duzee, 1917). A number of extra-limital species are included in the treatment, because they appear likely to occur within the state. The inclusion of these in this paper is of importance for their identification when they are actually found.

Acknowledgments

This project would never have been completed in its present form without the aid and encouragement of many persons to whom the writer is greatly indebted.

Thanks are due to H. A. Dorst, E. P. Breakey, R. H. Davidson, D. J. Knoll, R. H. Beamer, D. M. DeLong, and especially P. W. Oman for checking certain of the species determinations made by the writer and in some cases for the actual identification of the species.

The writer gratefully acknowledges the assistance of P. W. Oman for advice regarding certain taxonomic portions of the manuscript and his kindness in making accessible valuable un-

published information. Expression of deepest gratitude is made to Dr. Clarence E. Mickel who has given much advice and encouragement during the preparation of the manuscript and rendered valuable aid in checking many of the original references at a time when the writer was without facilities for this work.

The writer wishes to emphasize his indebtedness to Dr. A. A. Granovsky for suggestion of the problem and encouragement during the course of research; to Dr. W. A. Riley who read parts of the manuscript; to P. W. Oman and Dr. Clarence Mickel who read it in its entirety, for their helpful criticisms and suggestions; and to his wife for the immeasurable assistance rendered in typing the manuscript.

Sources of Material

The specimens on which this study is based came from two principal sources. A large part of the material was provided by the accumulated specimens in the insect collection of the University of Minnesota.

The second principal source of material was the collection of leafhoppers accumulated from the operation of insect light traps in Ramsey County, Minnesota, over a period of eight years. A total of 622,225 specimens have been identified in this light trap material, from which 2,000 specimens representing 210 species were pinned and deposited in the insect collection of the University of Minnesota.

In addition to the material mentioned above, a considerable number of specimens was collected by the writer during the three years he lived in Minnesota. Particular attention was directed toward the collection of the subfamily *Cicadellinae* which was less well represented in the University collection than the other subfamilies.

Unless otherwise noted, all specimens enumerated herein are deposited in the insect collection of the University of Minnesota.

SYSTEMATIC TREATMENT¹

THE GENERA of the leafhoppers found in Minnesota may be segregated into the relatively distinct groups which are indicated in the following key. These groups are recognized primarily for the purpose of associating apparently related genera, and their

¹Previous systematic studies of the midwestern leafhopper fauna have been made by Lawson (1920) for Kansas and Osborn (1928) for Ohio.

designation as subfamilies does not necessarily indicate equivalent categorical values. The recognition of an increased number of higher categories in the Nearctic fauna follows the trend of workers on the Cicadellidae throughout the world. The arrangement of the key is adapted to the needs of a particular faunal area and does not necessarily express the phylogenetic relationships of the family from a world point of view. The writer acknowledges the advice and assistance of Dr. P. W. Oman in the arrangement and recognition of these groups.

Key to Subfamilies

1. Dorsal surface of head formed in large part by upper part of front; ocelli thus on disc of crown remote from eyes and from anterior margin 2
 Front confined to face except sometimes for a narrow border on crown; ocelli thus on face, on or near anterior margin of crown, or lacking 5
2. Cylindrical in form; lateral sutures of front continued over obtuse anterior margin of crown to near ocelli; hind wing usually with three apical cells **Amblycephalinae**
 Broad and flattened in form; lateral sutures of front terminating below the usually sharp and distinct anterior margin of crown; hind wing with four apical cells 3
3. Crown in profile acutely angled with front; elongate in form; fore wings not overlapping apically 4
 Crown in profile obtusely rounded to and strongly overhanging the very short and concave front; short and broad in form; fore wings closely overlapped apically **Penthimiinae**
4. Dorsal surface of pronotum punctate **Ledrinae**
 Dorsal surface of pronotum transversely striate **Gyponinae**
5. Crown broad and wide, more or less rounded to the front; ocelli on face between the eyes 6
 A more or less distinct margin between crown and front; ocelli on or near anterior margin of crown, or absent 9
6. Lateral sutures of front extending above antennal pits to near ocelli; fore wing with a large and distinct appendix **Eurymelinae**
 Lateral sutures of front terminating at or near antennal pits; fore wing usually with appendix very small or lacking 7
7. Lateral margin of pronotum as long as greatest diameter of eye and distinctly carinate **Bythoscopinae**
 Lateral margin of pronotum much shorter and not carinate 8
8. Distance between ocelli usually greater than twice the distance from ocellus to eye; hind wing with three apical cells **Macropsinae**
 Distance between ocelli but slightly greater than distance from ocellus to eye; hind wing with four apical cells **Agalliinae**
9. Basal median suture of front carinate; ocelli removed from anterior margin of crown; a carina bordering the ocellocular area **Evacanthinae**
 Basal suture of front obsolete; ocelli on or near anterior margin of crown, or absent 10

10. Small, fragile species, often brightly colored; ocelli usually absent; nervures of the fore wing without cross veins anterior to apical cross veins **Cicadellinae**
 Larger species; ocelli on or near anterior margin of crown; nervures of fore wing branching and with cross veins anterior to apical cross veins 11
11. Crown blunt anteriorly, posteriorly expanded to about half the width of the prominent eyes, raised perpendicularly at the sides and base; ocellocular area distinctly ledged over antennal pit; fore wing broad; hind wing with costal area widened for a short distance near base **Jassinae**
 Crown of various shapes, rarely expanded posteriorly; ocellocular area without a distinct ledge above antennal pit; fore wing broad or narrow; costal area of hind wing not widened basally 12
12. Ocellus just behind anterior margin of crown (except *Xestocephalus*) and distant from eye **Aphrodinae**
 Ocellus on anterior margin of crown and proximal to eye 13
13. Crown produced, with entire anterior margin sharp, often thin and foliaceous; fore wing usually greenish-subopaque with degraded venation; legs without, or with only feeble bristles **Dorydiinae**
 Crown sometimes flattened and acutely angled, but seldom with entire anterior margin thin and foliaceous; fore wing usually hyaline or subhyaline and with complete venation; legs more or less strongly bristled 14
14. Usually slender, small leafhoppers; fore wing with only two antepical cells; hind wing with three apical cells **Balcluthinae**
 Usually medium size to large forms; fore wing usually with three antepical cells; hind wing with four apical cells **Athysaninae**

Subfamily EURYMELINAE Kirkaldy

1906. *Eurymelini* Kirkaldy. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent. Bul. 1:350.

IDIOCERUS Lewis

1836. Ent. Soc. London, Trans. 1:47.

GENOTYPE: *Idiocerus stigmaticallis* Lewis, 1836. Monobasic.

Wedge-shaped, with prominent eyes. Crown parallel margined, short and broad (Pl. III, Fig. 1), rounding to a relatively flat face. Fore wing longer than abdomen, with a distinct appendix, closely folded behind. Male antenna of most species with a dark, dislike terminal swelling.

The members of this genus are limited to *Salix*, *Populus*, and *Crataegus* in Minnesota, in so far as known. Osborn and Ball (1898c) reported two generations for all species, the adults hibernating and depositing eggs in the spring.

The North American species were last reviewed by Osborn and Ball (1898c). Additional species are listed by DeLong and Caldwell (1937c).

Key to Species

1. Crown unmarked, with no distinct spots.....2
Crown with dark markings, usually with two distinct spots.....7
2. 4.75 mm. or less in length; dark veins of hind wing visible through the fore wing.....**nervatus**
Larger, 5 mm. or more in length; veins of hind wing not visible.....3
3. Pronotum reddish brown, with a white median line.....**amabilis**
Pronotum yellow or green, without a median line, sometimes dark on posterior margin4
4. Commissure dark, usually a broad stripe; pronotum dark on posterior margin5
No distinct commissural marking; pronotum without dark markings 6
5. Stripe unbroken**suturalis**
Stripe interrupted with white on clavus..... **suturalis** var. **lunaris**
6. Species unicolorous, some shade of green..... **pallidus**
Species golden yellow; fore wing iridescent, dusky-tipped, especially in the male..... **duzei**
7. Light-colored; 4.75 mm. or less in length **rotundens**
Usually dark-colored; 5 mm. or more in length.....8
8. Nervures concolorous with fore wing; a narrow dark stripe along the commissure **snowi**
Fore wing hyaline or subhyaline with dark nervures.....9
9. Spots on crown large and round, about their own diameter from the eyes10
Spots on crown small, often obscured by dark markings, at least twice their own diameter from the eyes.....12
10. A pair of black spots on anterior margin of pronotum **craiaegi**
Without black spots on pronotum11
11. Claval suture with a faint white stripe; costal margin of fore wing darkly marked **fitchi**
Claval suture with a bright yellow stripe; costal margin not darkened **provancheri**
12. Color cinnamon brown; fore wing subhyaline with tuberculate brown nervures; no outer anteapical cell..... **brunneus**
Color usually dark; fore wing hyaline, the brown nervures interrupted with white; usually a distinct outer anteapical cell13
13. Conspicuous white interruptions along the cubitus; a median white line on the pronotum.....14
Not as above15
14. First cross vein broadly white; male antenna without a disc **moniliferae**
First cross vein not white; male antenna with a moderate-sized disc **alternatus**
15. Size large, 6.5 mm. or more..... **lachrymalis**
Size smaller, 6 mm. or less..... **formosus**

Idiocerus amabilis Ball1902. *Idiocerus amabilis* Ball. Canad. Ent. 34:306.

Crown, pronotum, and scutellum fulvous brown; male darker, with black marks in basal angles of scutellum. Fore wing golden

iridescent, lighter toward costal margin. Commissure dark, outlining the scutellum in a dark V and interrupted by a white spot on the clavus. Length: male, 5.25 mm., female, 5.75 mm.

Specimens examined: 10; Jay Cooke Park, Eagle Bend, Owatonna, Minneapolis, Princeton (on tamarack); June-September.

Idiocerus nervatus Van Duzee

1894. *Idiocerus nervatus* Van Duzee. Buffalo Soc. Nat. Sci. Bul. 5:205.

Small, green; fore wing hyaline, the dark veins of the hind wing showing through. Antennal disc small, nearly circular. Length: female, 4.75 mm., male, 4.5 mm.

Not yet collected in Minnesota, but should be found on willow, since it is said to occur throughout the United States.

Idiocerus pallidus Fitch

(Pl. III, Fig. 1)

1851. *Idiocerus pallidus* Fitch. Homop. N. Y. State Cab., p. 59. (Also: 1893. N. Y. State Ent. Rpt. 9:399.)

Large, uniformly pale green, with reddish-brown eyes. The color of many specimens becomes faded. Antennal disc oblong, black. Length: male, 6 mm., female, 6.25 mm.

A common species found on willow and also collected at lights. Specimens examined: 81; throughout the state.

Idiocerus suturalis Fitch

1851. *Idiocerus suturalis* Fitch. Homop. N. Y. State Cab., p. 59. (Also: 1893. N. Y. State Ent. Rpt. 9:399.)

Yellowish green, with a dark-brown stripe along the commissure. Dark spots at base of pronotum, which sometimes are faded. Fore wing yellowish hyaline, with a dusky apex. Antennal disc moderately long, elongate. Length: male, 5.25 mm., female, 5.75 mm.

Nothing is known about the host plants in Minnesota, but according to authors it is found on willow, poplar, and birch.

Specimens examined: 150; found from the last of June to the middle of August in Carlton, Cook, Hubbard, Lake, Polk, Ramsey, and Washington counties.

Idiocerus suturalis var. *lunaris* Ball

1902. *Idiocerus suturalis* var. *lunaris* Ball. Canad. Ent. 34: 311.

Resembles *suturalis* in size and form, but differs by a light-colored crescent on the middle of the clavus which interrupts the broad dark stripe along the commissure.

This variety is found on willow, and also collected at lights. Specimens examined: 53; taken principally in northern counties; July and August.

Idiocerus duzeei Provancher

1890. *Idiocerus Duzeei* Provancher. Pet. Faune Ent. Canad. 3:292.

Crown and pronotum immaculate, yellow to greenish yellow. Fore wing golden iridescent, smoky-tipped in the females, fuscous in the males. Length: male, 6.25 mm., female, 7 mm.

The writer has taken this species rather commonly on young broad-leaved cottonwoods in July. The fresh specimens are sometimes distinctly green.

Specimens examined: 298; Grey Cloud Island, St. Anthony Park, St. Paul, Hennepin County, Hinckley, Ft. Snelling high prairies association, and Anoka County; June to July.

Idiocerus alternatus Fitch

1851. *Idiocerus alternatus* Fitch. Homop. N. Y. State Cab., p. 59. (Also: 1893. N. Y. State Ent. Rpt. 9:399.)

Crown broadly curved, parallel margined, usually with triangular brown markings next to each eye, and with heavier markings between the two black spots. Face of male with longitudinal brown stripes, irregularly mottled in female. Pronotum dark brown with a median light stripe. Basal angles of scutellum black. Fore wing hyaline with the dark-brown veins interrupted with white on the commissure and along the cubitus. Length: male, 5 mm., female, 5.5 mm.

On willow from the last of May until the last of September.

Specimens examined: 31; Anoka, Carlton, Chippewa, Chisago, Clearwater, Lake, Olmsted, Pine, Ramsey, Red Lake, and Todd counties.

Idiocerus rotundens DeLong and Caldwell

1937. *Idiocerus rotundens* DeLong and Caldwell. Ohio Jour. Sci. 37:162.

Pale yellowish fading to white. Crown with a black spot on each side of a broad, faded orange band, which runs down the front. Scutellum pale, with basal angles dark. Nervures concolorous with fore wing, brownish beyond apical cross veins in males. Antennal disc black and circular. Length: male, 4.5 mm., female, 4.75 mm.

According to DeLong and Caldwell (1937b) this species has

been confused with *verticis* (Say) for many years. However, a neotype male of *verticis* by these authors has an irrorate crown, pronotum, and scutellum and is without black spots on the crown. Oman (in letter) has called the writer's attention to the similarity between Say's description of *Jassus verticis* and a female specimen of *Oncopsis distinctus* (V. D.). The type locality of *verticis* is within the range of *distinctus* on walnut.

Specimens examined: 17; Ramsey County, Sibley County (river near Blakeley), Olmsted County, Faribault, Winona County, and Washington County on willow; May to July.

Idiocerus moniliferae Osborn and Ball

1898. *Idiocerus moniliferae* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:71.

A broad species; fore wing with the first cross vein broadly white. Pronotum irrorate, brownish fuscous except for a median light line. Crown with brownish markings next to the eyes and with two rather small black spots between the eyes. Length: male, 5.5 mm., female, 5.75 mm.

Specimens examined: 1 male, Olmsted County.

Idiocerus formosus Ball

1902. *Idiocerus formosus* Ball. Canad. Ent. 34:305.

Resembles *lachrymalis* in structure and coloration, but distinguished by its smaller size. Length: female, 6 mm., male, 5.25 mm.

Specimens examined: 87; Cass, Carlton, Cook, Hennepin, Lake, Polk, Ramsey, and Red Lake counties; May to September.

Idiocerus lachrymalis Fitch

1851. *Idiocerus lachrymalis* Fitch. Homop. N. Y. State Cab., p. 58. (Also: 1893. N. Y. State Ent. Rpt. 9:398.)

Our largest species. Yellowish green to a pale yellowish brown. Crown slightly shorter on the middle than next to the eye. Markings variable; usually two rather small black spots on crown connected by a black band; a triangular black marking next to each eye; females usually with a spot below each ocellus. Fore wing hyaline, with dark brown tuberculate nervures and the claval veins with white interruptions at the commissure. Length: male, 6.5 mm., female, 7.5 mm.

Found on aspen.

Specimens examined: 22; Grey Cloud Island, St. Paul, St. Anthony Park, and Two Harbors; June to August.

Idiocerus brunneus Osborn and Ball

1898. *Idiocerus brunneus* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:72.

Broad, dull cinnamon brown. Crown with two black spots, each narrowly encircled with yellow; an interrupted yellowish line transversely across the face below the spots. Fore wing brownish, subhyaline, with tuberculate brown nervures. Length: male, 5.25 mm., female, 5.5 mm.

Specimens examined: 9; McIntosh, Lake City, and Big Stone County; July and August.

Idiocerus snowi Gillette and Baker

1895. *Idiocerus snowi* Gillette and Baker. Colo. Expt. Sta. Bul. 31:79.

Slender, pale green, immaculate except for a narrow dark stripe from tip of scutellum to tip of clavus and with two small black dots on crown. Length: male, 5.5 mm., female, 5.75 mm.

Oman (in letter) has informed the writer that the Minnesota specimens represent an eastern variety of the typical *snowi* named by Ball (MS). Collected commonly throughout the state on willow, especially the narrow-leaved varieties, from which the writer has made several collections in July.

Specimens examined: 734; throughout the state after the last of June.

Idiocerus crataegi Van Duzee

1890. *Idiocerus crataegi* Van Duzee. Canad. Ent. 22:110.

Olive drab. Six black spots on yellowish-green crown, pronotum, and scutellum as follows: a triangular pair at base of scutellum, a similar pair on anterior margin of pronotum, and a large round pair on crown. Length: female, 5.5 mm., male slightly smaller.

Not yet recorded from Minnesota, but it is reported from Iowa and Wisconsin and should be collected on *Crataegus*.

Idiocerus provancheri Van Duzee

1890. *Idiocerus Provancheri* Van Duzee. Canad. Ent. 22:111.

Chestnut brown; males darker than the females. It is distinguished by a bright yellow stripe along the claval suture. Length: male, 5 mm., female, 5.5 mm.

Not yet recorded for Minnesota, but it is reported from Iowa and Wisconsin and should occur here on *Crataegus*.

Idiocerus fitchi Van Duzee1909. *Idiocerus Fitchi* Van Duzee. Canad. Ent. 41:383.

Chestnut brown, crown with two round spots. Face of male marked with a longitudinal median dark stripe, immaculate in female. Pronotum dark on anterior margin with light spots behind. Fore wing brownish with a faint white stripe along claval suture. Costal margin of fore wing dark, a hyaline band crossing it before the tip. Length: male, 5 mm., female, 6 mm.

Specimens examined: 2; St. Paul, Kellog (g); June and July.

Subfamily MACROPSINAE Evans

1936. *Macropsini* Evans. Roy. Soc. Tasmania, Papers and Proc. 1935:63.

Key to Genera

- Pronotum distinctly angulate on anterior margin; pronotal striae oblique, converging anteriorly on a median line (Pl. III, Fig. 6).....**Macropsis**
 Pronotum broadly rounded on anterior margin; pronotal striae transverse, or nearly so (Pl. III, Fig. 7).....**Oncopsis**

MACROPSIS Lewis

1836. Ent. Soc. London Trans. 1:49.

GENOTYPE: *Cicada virescens* Gmelin, 1789. Subsequent designation.

This group includes many species similar in form and appearance. Crown short and angled so that anterior margin of pronotum is produced before the eyes. Pronotum with oblique striations converging anteriorly along a median line (Pl. III, Fig. 6). Fore wing longer than abdomen, appendix usually absent. Many forms have black markings on the epimeron which are of specific value.

Osborn and Ball (1898b) and Ball (1903) discussed the food plants of some species. Breakey (1932) revised the genus. New species have since been added by Knull (1940).

Key to Species

1. A small shiny black spot at apex of crown.....**virescens** var. **graminea**
 Without a spot at apex of crown.....2
2. Nervures of fore wing closely lined with fuscous dots.....**tristis**
 Nervures of fore wing not lined with fuscous.....3
3. Fore wing brownish opaque, with one to three clear round spots.....4
 Fore wing otherwise and without clear spots.....5
4. One clear spot on each fore wing which may be obscure or covered with whitish bloom.....**insignis**
 Three clear spots in a row on each fore wing, the anterior one sometimes obscure**trimaculata**

5. Males	6
Females	20
6. Fore wing some uniform shade of green, yellow, or light amber.....	7
Fore wing marked or colored differently.....	10
7. Tarsi black	8
Tarsi not black.....	9
8. Face unmarked	<i>trivialis</i>
Face banded or spotted with black.....	<i>reversalis</i>
9. Epimeron with a black spot.....	<i>viridis</i>
Epimeron unmarked	<i>gleditschiae</i>
10. Fore wing of nearly the same shade or color throughout.....	11
Fore wing with distinctly contrasting bands or irregular spots.....	15
11. Head and thorax predominantly green; fore wing smoky hyaline.....	12
Head and thorax black or brown.....	13
12. Fore wing smoky hyaline.....	<i>erythrocephala</i>
Fore wing dark brown or amber.....	<i>suturalis</i>
13. Dorsum black, sharply contrasted with the light venter.....	<i>bicolor</i>
No sharp contrast between venter and dorsum.....	14
14. Pronotum concolorous	<i>basalis</i>
Pronotum darkly maculate with fuscous in the anterior impression	<i>bifasciata</i>
15. Scutellum green, basal angles black.....	16
Scutellum not green.....	17
16. Fore wing hyaline, black at base and apex.....	<i>nigricans</i>
Fore wing opaque, brownish black, costal margin usually green	<i>fumipennis</i>
17. Dorsum showing green; fore wing with a black basal band.....	<i>osborni</i>
Dorsum dark	18
18. Fore wing uniformly reddish brown except for a narrow hyaline band before the apex.....	<i>ferrugineoides</i>
Fore wing irregularly mottled with fuscous.....	19
19. Fore wing smoky hyaline, banded across the middle and at the apex	<i>canadensis</i>
Fore wing irregularly infuscated, without bands.....	<i>sordida</i>
20. Fore wing uniformly green or yellow.....	21
Fore wing banded or not uniformly green or yellow.....	26
21. Head and thorax reddish brown.....	<i>rufcephala</i>
Head and thorax concolorous with fore wing.....	22
22. Epimeron with a heavy black dash.....	<i>erythrocephala</i>
Epimeron immaculate	23
23. Less than 4.75 mm. in length.....	24
5 mm. or more in length.....	25
24. Bright green; fore wing sometimes smoky apically.....	<i>gleditschiae</i>
Light green, pronotum and face yellowish green; without smoky fore wing	<i>reversalis</i>
25. Posterior margin of sternite VII without a median notch.....	<i>viridis</i>
Sternite VII with a distinct median notch.....	<i>trivialis</i>
26. Fore wing nearly uniform in color.....	27
Fore wing banded with distinctly contrasting colors.....	29
27. Fore wing dark brown; dorsum contrasting sharply with the light venter	<i>bicolor</i>

- Fore wing reddish brown; no sharp contrast between venter and dorsum 28
28. Crown sharply pointed; an indistinct hyaline band before apex of fore wing *ferrugineoides*
- Crown obtusely pointed; costal margin of fore wing greenish *fumipennis*
29. Fore wing greenish hyaline except for entirely black clavus *suturalis*
Fore wing more extensively marked with black 30
30. Fore wing with transverse bands crossing clavus 31
Fore wing with irregular fuscous markings; banding, if present, not crossing clavus 34
31. A deep-brown or dark-fuscous band at base of fore wing 32
Without a band at base of fore wing 33
32. 6 mm. in length; head and thorax concolorous with body *osborni*
5 mm. in length; head and thorax much darker than remainder of body *basalis*
33. Band to clavus oblique; a large black spot on epimeron *bifasciata*
Band to clavus nearly transverse; epimeron immaculate *canadensis*
34. Fore wing with irregular fuscous mottlings *sordida*
Black on fore wing usually restricted to ill-defined markings at base of costal margin *nigricans*

Macropsis virescens var. *graminea* (Fabricius)

1798. *Cicada graminea* Fabricius. Ent. Syst., Suppl., p. 521.

1916. *Macropsis virescens* var. *graminea* Van Duzee. Check List Hemip., p. 64.

Golden green, immaculate except for a shiny black spot at the apex of a distinctly pointed crown, and a black spot at the base of the hind tibia. Length: female, 5 mm.

Weiss and Dickerson (1919) studied the life history of this species on Lombardy poplar.

Specimens examined: 2; Ramsey County.

Macropsis reversalis (Osborn and Ball)

1898. *Pediopsis reversalis* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:69.

Small, green, the female immaculate; male with a black spot on epimeron with black on extremities of legs, and with two black stripes across face; the latter variable, sometimes broken and reduced to three spots. Length: male, 4 mm., female, 4.5 mm.

Not yet recorded in Minnesota, but it has been taken in Iowa on willow and should occur here.

Macropsis trivialis (Ball)

(Pl. III, Fig. 6)

1902. *Pediopsis trivialis* Ball. Canad. Ent. 34:304.

Pronotum acutely angled anteriorly; face angled or slightly rounded to crown in lateral view. Female yellowish green, some-

times faded to yellow, immaculate except for a dark-tipped rostrum and rarely a dark spot on epimeron. Posterior margin of sternite VII with a distinct median notch. Male green, characteristically marked with black on tip of rostrum, apices of anterior, and sometimes middle tibiae, and the distal segments of all the tarsi. Some specimens of both sexes are heavily marked on the fore wing with bronze. Usually a round black spot on epimeron, but this may be lacking or reduced to a dot. Length: female, 5.75 mm., male, 5 mm.

A willow species, nymphs being found in large numbers during the last of June and early July on willow.

Specimens examined: 89; throughout the state.

Macropsis viridis (Fitch)

1851. *Pediopsis viridis* Fitch. Homop. N. Y. State Cab., p. 59.
(Also: 1893. N. Y. State Ent. Rpt. 9:399.)

Females uniformly yellowish green. Male light brown with a black dash on epimeron; rarely green with a brownish fore wing. Length: male, 4 mm., female, 5 mm.

Females of this species closely resemble *trivialis* and probably have been confused with it. Usually *viridis* may be distinguished by its smaller size, posterior margin of sternite VII lacking a median notch, and a definite constriction of the female pygofer near its apex. Found on willow.

Specimens examined: 8; Washington County, Polk County, Itasca Park, Carlton County (Elkhorn Creek), Warren, and Ramsey County; June and July.

Macropsis suturalis (Osborn and Ball)

1898. *Pediopsis suturalis* Osborn and Ball. Davenport Acad. Sci. Proc. 7:67.

Female bright green; clavus black, the stripe extending to apex of fore wing. Male green, suffused with fuscous; basal angles of scutellum dark. Fore wing very dusky, translucent, the claval area sometimes black. Epimeron with a black dash. Length: male, 5 mm., female, 5.5 mm.

Specimens examined: 25; Itasca Park, Kittson County, Eagle Bend, Hennepin County, Huot, and Polk County; June to August.

Macropsis bicolor (Osborn)

1915. *Pediopsis bicolor* Osborn. Maine Agr. Expt. Sta. Bul. 238:90.

Brownish black above, with fuscous spreading onto upper half of face; yellowish green or yellow below. Female usually with a

black mark on pygofer near the middle; male with black dash on epimeron. Length: male, 5 mm., female, 5.5 mm.

Specimens examined: 7; Itasca Park, Aitkin County (tamarack), Kittson County, Polk County, and Anoka County; June and July.

Macropsis sordida (Van Duzee)

1894. *Pediopsis sordida* Van Duzee. Canad. Ent. 26:89.

Grayish green, sometimes yellowish brown, but mottled and darkly overlaid with fuscous. Fore wing smoky hyaline, irregularly clouded with fuscous. Epimeron of both sexes with a black dash. Length: male, 4.25 mm., female, 5 mm.

Specimens examined: 1; Kittson County; June 25, 1936.

Macropsis canadensis (Van Duzee)

1890. *Pediopsis canadensis* Van Duzee. Canad. Ent. 22:111.

Yellowish green; the scutellum, anterior portion of pronotum, crown, and face yellowish brown; basal angles of scutellum dark brown. Fore wing hyaline, with a broad reddish-brown band near the middle and a smaller band at the apex. Length: female, 5 mm.

This species may be confused with some varieties of *basalis*, but may be distinguished by the light-colored head and thorax.

Specimens examined: 1; Washington County; July 4, 1940.

Macropsis rufcephala Osborn

1932. *Macropsis rufcephalus* Osborn. Ohio Jour. Sci. 32:513.

Scutellum, pronotum, and upper half of face reddish brown in contrast to the yellowish-green wings. Scutellum with basal angles dark. Epimeron of female immaculate. Male unknown. Length: female, 5.5 mm.

This is a distinctly marked species, but much like *basalis* in size and form, and conceivably may be a variety with the markings on the fore wing lacking.

Specimens examined: 3; Holt, Ramsey County, and Faribault; June and July.

Macropsis ferrugineoides (Van Duzee)

1889. *Pediopsis ferrugineoides* Van Duzee. Ent. Amer. 5:171.

Large, reddish brown, except for yellow below and on lower half of face. Fore wing with an irregular hyaline band beyond the middle. A large black spot on the epimeron of both sexes. Length: male, 5 mm., female, 5.75 mm.

Specimens examined: 4; Winona and Ramsey counties; July to September.

Macropsis erythrocephala (Gillette and Baker)

1895. *Pediopsis erythrocephala* Gillette and Baker. Colo. Expt. Sta. Bul. 31:72.

A large and distinctive species. Female dull green, sometimes tinged with brown on head and thorax, the yellowish-brown legs contrasting sharply with the general body color. Male dark brown or greenish brown; fore wing smoky hyaline; tarsi sometimes black. Basal angles of scutellum usually black, and with black dots on pronotum posterior to eyes. The epimeron of both sexes has a heavy black dash. Both sexes show great variation in markings and color and in some cases the head, pronotum, and face have a reddish tinge. Length: male, 5 mm., female, 6 mm.

Commonly collected on willow by the writer during early July, 1940, in Washington County.

Specimens examined: 33; Ramsey, Winona, Hennepin, Wabasha, and Scott counties; last of June and July.

Macropsis osborni Breakey

1932. *Macropsis osborni* Breakey. Ent. Soc. Amer. Ann. 25: 817.

Yellowish green; fore wing with a coppery cast; a broad black band contiguous to scutellum. Male darker; basal angles of scutellum dark; epimeron with a dark spot. Length: male, 5 mm., female, 6 mm.

According to Breakey (1932) two female paratypes of this species are in the University of Kansas collection labeled: Grey Cloud Island, July 12, 1929 (H. H. Knight).

Specimens examined: 2; St. Paul, July 12; Savage Creek, June 14, 1932.

Macropsis nigricans Van Duzee

1916. *Macropsis nigricans* Van Duzee. Check List Hemip., p. 64.

1932. *Macropsis nigricans* Breakey. Ent. Soc. Amer. Ann. 25:819.

Female a dull, greenish brown, often faded to yellow; basal angles of scutellum usually dark. Fore wing dull hyaline, marked with fuscous on basal half along costal margin, this color irregularly spreading on to claval suture with great variation in amount and pattern of markings. Scutellum of male dark, with basal

angles pitch black. Fore wing smoky hyaline, distinctly dark on basal half and at apex. Epimeron of both sexes with a black spot. Length: male, 4.75 mm., female, 5.5 mm.

A series of females is included here which agrees closely with the above description except for a loss of the marking on the epimeron.

Specimens examined: 15; Washington County, Alma township east of Argyle, Hennepin County, Owatonna, Eagle Bend, Polk County, Gentilly, and Ramsey County; June to August.

Macropsis bifasciata (Van Duzee)

1889. *Pediopsis bifasciata* Van Duzee. Ent. Amer. 5:173.

Female dull greenish fuscous, yellow below. Fore wing grayish hyaline, with two fuscous bands, one crossing obliquely near middle, displaced on the claval suture, the other crossing just before the apex. Male darkly fuscous, yellow below; basal angles of scutellum dark. Fore wing fuscous hyaline, without bands. Length: male, 5 mm., female, 5.5 mm.

Several specimens have been taken by the writer on quaking aspen near Marine, Minnesota.

Specimens examined: 1; Whitefish Lake; July 1-5, 1921.

Macropsis tristis (Van Duzee)

1890. *Pediopsis tristis* Van Duzee. Canad. Ent. 22:249.

Brown, distinctly black-marked on face, with a band above and a large spot below. Nervures of fore wing margined with fuscous. Length: female, 5.5 mm., male, 4.75 mm.

Specimens examined: 3; Alexandria, Crookston, and Sacred Heart; June and July.

Macropsis basalis (Van Duzee)

1899. *Pediopsis basalis* Van Duzee. Ent. Amer. 5:171.

Upper part of face, pronotum, and scutellum usually brownish red or olive green; underneath greenish, but the color varies greatly. Fore wing hyaline, females variously banded as follows: (a) a red, dark-brown, or black band on basal part of clavus contiguous to margin of scutellum; (b) in addition to the basal band a reddish-brown band across posterior part of clavus, widening toward the costa, and a reddish-brown band at apex; (c) as in (b) but lacking the distinct basal band; (d) with a black basal band, the remainder of fore wing very heavily infuscated; (e) without a basal band, but fore wing infuscated.

Females usually lack the mark on epimeron, but a dark dot may be present in the more heavily colored forms. Male dark

brown; basal angles of scutellum dark; fore wing smoky amber with basal part dark. Length: male, 4.5 mm., female, 5 mm.

Specimens examined: 15; Washington, Clearwater, Ramsey, Crow Wing, Cass, Cook, and Itasca counties; on aspen; July.

Macropsis fumipennis (Gillette and Baker)

1895. *Pediopsis fumipennis* Gillette and Baker. Colo. Expt. Sta. Bul. 31:73.

Yellowish green, the epimeron immaculate. Fore wing reddish brown, costal margin green-tinged. Length: female, 5 mm.

Specimens examined: 1; Ramsey County; July 11, 1923.

Macropsis gleditschiae (Osborn and Ball)

1898. *Pediopsis gleditschiae* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:67.

Deep green, sometimes faded to lighter green or yellow. A slender species with distinctly angled crown. Both sexes are without markings, but the fore wing of some specimens is tinged with fuscous. Length: male, 4.25 mm., female, 4.75 mm.

Reported to be found on honey locust.

Specimens examined: 26; Clearwater, Todd, Cass, Ramsey, Hennepin, and Mille Lacs counties; June to August.

Macropsis trimaculata (Fitch)

1851. *Pediopsis trimaculatus* Fitch. Homop. N. Y. State Cab., p. 60. (Also: 1893. N. Y. State Ent. Rpt. 9:400.)

Females dark gray or brownish; males nearly black with a black bar on the epimeron sometimes obscured by a heavy fuscous stain. Fore wing with three whitish spots in a row, sometimes the anterior one obscured. Length: female, 4.25 mm., male, 4 mm.

Hartzell (1937) summarized our knowledge of the life history. The species is distributed in the eastern United States, south to Virginia, north to Ontario and Quebec, and as far west as Colorado. The principal wild host is *Prunus americana*, but it also occurs on other *Prunus* sp. The habits are unlike most leafhoppers, for it is only occasionally observed on foliage; both nymphs and adults prefer to feed on twigs. It seldom flies or hops, but seeks concealment in the forks of limbs or behind branches with exceptional agility. There is only one generation during the year. Winter is passed in the egg stage in slits beneath the outer bark of plum or sometimes peach.

Although reported by Breakey (1932) in Minnesota, specimens are not represented in the Minnesota collection.

Macropsis insignis (Van Duzee)1889. *Pediopsis insignis* Van Duzee. Ent. Amer. 5:171.

Female reddish brown; male dark brown. Pronotum with distinct striations and lighter in color than fore wing. Scutellum with brown in basal angles. Fore wing brownish opaque except for a small clear spot at base of middle anteapical cell, sometimes obscure. Some specimens covered with a whitish bloom. Length: male, 4.25 mm., female, 5 mm.

Reported to occur on wild plum.

Specimens examined: 43; Sacred Heart, Olmsted County, Lake City, Traverse County, and Ramsey County; June and July.

ONCOPSIS Burmeister

1838. Genera Insectorum 1:27.

GENOTYPE: *Cicada flavicollis* Linnaeus, 1761. Subsequent designation.

Species with a very short crown; face tumid in lateral view. Anterior margin of pronotum acutely rounded and extended before the eyes. Pronotum with striations, sometimes obscure, which are transverse or slightly rounded anteriorly, but not obliquely angled (Pl. III, Fig. 7). Fore wing short, broadly rounding at the apex, without an appendix.

Revisional work in this genus (as *Bythoscopus*) was last done by Van Duzee (1890). New species described since are listed by DeLong and Caldwell (1937c).

Key to Species

- | | |
|---|-------------------|
| 1. Fore wing with two anteapical cells..... | <i>distinctus</i> |
| Fore wing with three anteapical cells..... | 2 |
| 2. Face marked with black..... | <i>pruni</i> |
| Face unmarked | 3 |
| 3. Amber brown in color..... | <i>sobrius</i> |
| Predominantly yellow in color..... | 4 |
| 4. Clavus yellow, outlined with dark brown..... | <i>variabilis</i> |
| Unicolorous yellowish green..... | <i>fagi</i> |

Oncopsis variabilis (Fitch)

1851. *Athysanus variabilis* Fitch. Homop. N. Y. State Cab., p. 60. (Also: 1893. N. Y. State Ent. Rpt. 9:400.)

Minnesota specimens (except below) are the variety with the clavus yellow, or yellowish white, usually outlined with dark brown along the claval suture. Length: female, 5 mm.

A single female, Kittson County, July 2, 1938, is unicolorous sulfur yellow. Sternite VII with a median U-shaped notch which is about one fourth as deep as the sternite.

Birch is reported as a host plant by Osborn (1915).

Specimens examined: 4; Floodwood, Two Harbors, Cook County, and St. Louis County; July and August.

Oncopsis sobrius (Walker)

1851. *Bythoscopus sobrius* Walker. List Homop. Ins. Brit. Mus. 3:874.

Amber brown, without markings, the underparts lighter in color than the dorsum. Fore wing amber, hyaline. Sternite VII with a small median notch on posterior margin. Length: female, 5.5 mm.

Birch is its normal host, according to Osborn (1915).

Specimens examined: 1; St. Louis County (shore Lake Superior at Split Rock); July 1, 1935.

Oncopsis pruni (Provancher)

1890. *Bythoscopus pruni* Provancher. Pet. Faune Ent. Canad. 3:290.

Cinereous or grayish yellow, variable in markings but usually distinguished by black on each side of a broad yellow band connecting the ocelli. Pronotum yellow, much darkened by fuscous punctures and black behind the eyes. Fore wing smoky hyaline, the nervures brown. Sternite VII triangular, truncate on posterior margin with a shallow median notch. Length: male, 4.5 mm., female, 5 mm.

Osborn (1915) considered birch the usual food plant, although occasionally it is taken on various other plants.

Specimens examined: 38; found in late summer in the region around Lake Superior.

Oncopsis fagi (Fitch)

1851. *Athysanus fagi* Fitch. Homop. N. Y. State Cab., p. 61.
(Also: 1893, N. Y. State Ent. Rpt. 9:401.)

Unicolorous, greenish yellow, the fore wing fading to semi-hyaline. Sternite VII with a median U-shaped notch about one fourth the length of sternite. Length: female, 5.5 mm.

Specimens examined: 1; Lake County; July 4, 1938.

Oncopsis distinctus (Van Duzee)

(Pl. III, Fig. 7)

1890. *Bythoscopus distinctus* Van Duzee. Ent. Amer. 6:225.

Variable in markings, but easily distinguished by the presence of only two anteapical cells. Fore wing subhyaline, clouded with fuscous, but usually distinctly marked with dark at the middle

and apex of clavus. Basal angles of scutellum black, pronotum with black on anterior margin behind the eyes. Length: male, 4 mm., female, 4.5 mm.

Specimens examined: 42; Minnetonka Lake, Olmsted County (on walnut), Madison, New Ulm, and Ramsey County; June.

Subfamily AGALLIINAE Kirkaldy

1906. *Agalliinae* Kirkaldy. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent. Bul. 1:345.

Key to Genera

1. Surface of pronotum transversely striate (Pl. III, Fig. 5) *Aceratagallia*
Surface of pronotum not striate but finely granulated.....2
2. Crown shorter medially than next to the eye, a distinct widening next to the eye; posterior margin irregularly curved and elevated (Pl. III, Fig. 4).....*Agalliopsis*
Crown of nearly uniform length, no distinct widening next to the eye; posterior margin rounded and regularly curved (Pl. III, Fig. 3) *Agallia*

AGALLIOPSIS Kirkaldy

1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent. Bul. 3:11, 30.

GENOTYPE: *Jassus novellus* Say, 1831. Original designation.

Narrow, wedge-shaped, with crown distinctly widening next to the eyes (Pl. III, Fig. 4). Since the basic revision of *Agalliopsis* by Oman (1933), new species have been added by Oman (1935) and Ball (1936a). Ball (1936b) gave a useful key to the species occurring north of Mexico, and discussed their food plant relationships.

Agalliopsis novella (Say)

(Pl. III, Fig. 4)

1831. *Jassus novellus* Say. Acad. Nat. Sci. Phila. Jour. 6: 309. (Also: 1891. Compl. Writ. 2:384.)

Usually reddish brown, but often may be darker or lighter. Crown with a black spot next to each eye and above each ocellus. Pronotum with a black spot equidistant from anterior and posterior margins on each side of a dark median stripe. Length: male, 3.5 mm., female, 3.75 mm.

Oman (1933) studied the internal male genitalia and noted variations in the shape of the pygofer hook in specimens from various parts of the United States. Dissections of males from various places in Minnesota revealed marked local variations also.

There is only one generation a year, adults first appearing in the middle of May and being found until the middle of August.

Osborn and Ball (1898a) reported nearly full grown nymphs in Iowa passing the winter under leaves and rubbish, and it is probable they overwinter here in the same way.

DeLong and Davidson (1931) discussed this species among those injuring economic crops, but it is of relatively little importance in this region. Ball (1936b) stated that there is no definite food plant record. Minnesota specimens have been collected from poplar woods, tamarack swamps, alfalfa, and grasses.

Specimens examined: 38; throughout the state, but collected most commonly in the southeastern portion.

AGALLIA Curtis

1833. Ent. Mag. 1:193.

GENOTYPE: *Jassus puncticeps* Germar, 1832. Monobasic.

Crown of uniform short length, evenly curved on posterior margin, and with a black spot above each ocellus. Surface of pronotum finely granulated (Pl. III, Fig. 3). The genus has been revised by Oman (1933).

Only *Agallia 4-punctata* (Prov.) has been found in the state, but *Agallia constricta* V. D. is included in the key since it is reported from Iowa and may be present in southern Minnesota.

Key to Species

Plate constricted near middle, tip bluntly rounded; sternite VII constricted, posterior margin roundly produced, with a small median notch; form not robust, fore wing long and narrow.....*constricta*
Plates not constricted, together forming a slightly rounded triangle; posterior margin of sternite VII almost truncate; form robust, sides of fore wing with a bulge.....*4-punctata*

Agallia 4-punctata (Provancher)

(Pl. III, Fig. 3)

1872. *Bythoscopus 4-punctatus* Provancher. Nat. Canad. 4: 376.

Broad, robust, dark brown. Two black spots on margin of crown. A pair of black spots near posterior margin of pronotum wider apart than those on crown. Length: female, 4 mm., male slightly smaller. The male sex is not represented in the Minnesota collection.

Osborn and Ball (1898a) reported overwintering nymphs and a single generation in Iowa. The same life cycle probably holds true for Minnesota. Wolcott (1937) listed white clover as its usual host and reported two generations a year in New York. The Minnesota specimens are from tamarack swamps and grasses.

Specimens examined: 52; throughout state; May to August.

ACERATAGALLIA Kirkaldy

1907. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent.
Bul. 3:11, 30.

GENOTYPE: *Bythoscopus sanguinolentus* Provancher, 1872.
Original designation.

Crown of nearly uniform length with a black spot above each ocellus. Surface of pronotum transversely striated, without black spots but marked with longitudinal dark stripes (Pl. III, Fig. 5). New species have been added by Oman (1935) since his revision of the genus (1933).

Of the species occurring in Minnesota, *Aceratagallia sanguinolenta* (Prov.) is economically important and commonly found.

Key to Species²

- Form short and robust; fore wing barely exceeding abdomen in female; posterior margin of sternite VII slightly sinuate and with a small median notch; plate with the lateral margin rounded to the truncate tip, exceeded in length by the pygofer..... *sanguinolenta*
- Form slender; fore wing definitely longer than abdomen in female; posterior margin of sternite VII with a deep V-shaped notch; plate truncate apically and about equal to pygofer in length..... *uhleri*

Aceratagallia sanguinolenta (Provancher)

(Pl. III, Fig. 5)

1872. *Bythoscopus Sanguinolentus* Provancher. Nat. Canad.
4:376.

Rather small, broad, grayish brown, but may be darker. Crown with a brown patch next to each eye, a black spot above each ocellus, and a median double brown stripe. Pronotum with three pairs of longitudinal brown stripes widening towards the posterior margin. Fore wing brownish; dark veins on clavus interrupted with white to give a mottled appearance. Length: male, 2.75 mm., female, 3 mm.

Adults hibernate under dead leaves or rubbish, appearing early in the spring on many economically important plants or common weeds. The writer found a specimen hibernating under leaves in Hennepin County, February 11, 1940, and large numbers were collected on alfalfa in Anoka County, March 25, 1939. It has been recorded on legumes, potatoes, grasses, *Salix longifolia*, and many weeds.

² In addition to the species keyed here, *Aceratagallia accola* Oman, swept from a recently mown meadow in Minnesota just east of Wahpeton, N. D., July 24, 1935 (P. W. Oman), is in the U. S. National Museum collection.

DeLong and Davidson (1931) and Oman (1933) discussed this species as a pest in eastern United States where it attacks many truck and field crops and is especially common on plants belonging to the *Leguminosae*. Watkins (1939) reported on its biology in New York, listed 38 species of host plants, and obtained evidence of three, with perhaps a partial fourth, generations.

Specimens examined: 106; throughout the state.

Aceratagallia uhleri (Van Duzee)

1894. *Agallia uhleri* Van Duzee. Canad. Ent. 26:91.

Similar to *sanguinolenta* in general appearance, but is slightly larger and more slender in form. General color, brownish cinereous. Dark veins of the fore wing interrupted by whitish portions in claval and basal areas. Length: male, 3.5 mm., female, 3.75 mm.

It has been collected in Minnesota on beets, potato, alfalfa, wheat, and Russian thistle, but little is known about its hosts. Oman (1933) stated that it probably is economically important on sugar beets in Colorado and western Kansas.

Specimens examined: 87; Cook, Kittson, Norman, Polk, Ramsey, Anoka, and Hennepin counties; May to October.

Subfamily BYTHOSCOPIINAE Dohrn³

1859. *Bythoscopidae* Dohrn. Catalogus Hemipterorum, p. 84.

STRAGANIA Stål

1860. Rio Janeiro Hemip. 2:49.

GENOTYPE: *Gypona* (*Stragania*) *ornatula* Stål, 1862. Subsequent designation.

Crown short and broad, curved slightly forward of eyes, the face appearing compressed. Pronotum with lateral margin longer than diameter of eye, distinctly carinate. Crown, pronotum, and scutellum with fine transverse striations (Pl. III, Fig. 2, 2A). Fore wing thickly set with minute setae.

According to Oman (in letter), the American forms, *Stragania* Stål and *Pachyopsis* Uhler, differ from the European *Bythoscopus* Germar and *Batracomorphus* Lewis by the fact that the submarginal vein of the fore wing, separating the apical cell from the appendix, is evanescent distally, never extending beyond the base of the second apical cell.

³ The North American genera of this subfamily have been reviewed by Oman (1936 [1938]).

Stragania apicalis (Osborn and Ball)

(Pl. III, Fig. 2, 2A)

1898. *Macropsis apicalis* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:64.

Short, robust, bright green, sometimes faded to yellow. Crown over three times wider than long. Fore wing subhyaline, set with fine light-green hairs. Length: female, 5 mm., male, 4.5 mm.

Specimens examined: 23; St. Paul; July.

Subfamily PENTHIMIINAE Kirschbaum

1868. *Penthimiidae* Kirschbaum. Nassau. Ver. f. Naturk. Jahrb. 21 and 22:14.

PENTHIMIA Germar

1821. Mag. Ent. 4:38, 46.

GENOTYPE: *Cicada nigra* Goeze, 1778. Monobasic.

Compact in form, the head narrower than pronotum. Crown in profile rounding and overhanging the face, which is almost flat. Clavus truncate posteriorly, the apical part of fore wing appressed to abdomen and closely overlapped.

Lawson (1933) illustrated the two species of this genus found in North America.

Penthimia americana Fitch

1851. *Penthimia americana* Fitch. Homop. N. Y. State Cab., p. 57. (Also: 1893. N. Y. State Ent. Rpt. 9:397.)

Cercopidlike, oval, almost as broad as long. Males dark brown or black; females reddish brown, head and thorax black underneath. Length: male, 5 mm., female, 5.5-6 mm.

Specimens examined: 28; Ramsey, Anoka, Hennepin, Olmsted, Winona, and Morrison counties; May to July.

Subfamily GYPONINAE Stål⁴

1870. *Gyponina* Stål. Svenska Vetensk. Akad. Öfversigt af . . . Forhandl. 17:736.

Key to Genera

- | | |
|--|------------------|
| 1. Fore wing reticulate near apex..... | Gyponana |
| Fore wing venation regular, not reticulate..... | 2 |
| 2. Crown convex in profile, the margin thick but not greatly produced..... | Ponana |
| Crown flat in profile, the margin with front foliaceous..... | 3 |
| 3. Fore wing with dots or lines..... | Prairiana |
| Fore wing without dots or lines..... | Gypona |

⁴This subfamily has been reviewed by DeLong (1942, The North American Species of the Subfamily Gyponinae, exclusive of *Xerophloea*. Ohio State Univ. Studies 5:1-187).

GYPONANA Ball

1920. Ent. Soc. Amer. Ann. 13:84, 85.

GENOTYPE: *Tettigonia 8-lineata* Say, 1825. Original designation.

Crown in profile sharply angled with the front, the margin foliaceous. Fore wing elongate, narrowed at apex, the venation broken by numerous irregular reticulations.

Ball (1935) presented a key to the North American species and referred to his earlier work on this group.

Key to Species

1. Black spots usually on pronotum and hinge⁵; fore wing yellowish opaque, rugose; posterior margin of sternite VII rectangularly notched *rugosa*
 No black spots; fore wing usually greenish subhyaline; sternite VII not notched 2
2. Stripes on pronotum and most reticulations of fore wing scarlet *octolineata*
 Markings not scarlet; reticulations of fore wing some shade of green 3
3. Reticulations of fore wing including the clavus *cana*
 Reticulations of fore wing mostly at apex 4
4. Light green; broad; size usually 9 mm. or more *striata*
 Dark shining green; slender; size 8 mm. or less *tenella*

Gyponana 8-lineata (Say)

1825. *Tettigonia 8-lineata* Say. Acad. Nat. Sci. Phila. Jour. 4:340. (Also: 1891. Compl. Writ. 2:257.)

A large green species, the crown, pronotum, and fore wing heavily overlaid with scarlet which is usually arranged in six or eight longitudinal stripes on the pronotum. Length: female, 11 mm.

The biology and life stages of this species were discussed by Brittain (1920).

Specimens examined: 2; Olmsted and Ramsey counties.

Gyponana cana (Burmeister)

1838. *Gypona cana* Burmeister. Genera Ins. 1:50.

Compact, green to yellowish green. Fore wing coriaceous, the venation very conspicuous, with heavy reticulations throughout, including the clavus. Length: male, 9 mm., female, 11 mm.

Specimens examined: 15; Grey Cloud Island, Hennepin County, Faribault County, Cass County, Crookston, Beltrami County, Kawishiwi River, Winton, Lake County (Baptism Creek), Norman County, and Cramer; June to August.

⁵ Hinge—the portion of the claval suture just posterior to the lateral margin of the pronotum.

Gyponana striata (Burmeister)

(Pl. III, Fig. 12)

1838. *Gypona striata* Burmeister. Genera Ins. 1:49.

Large, light green, with six to eight orange-yellow longitudinal stripes on the pronotum. The size, color, and reticulations vary greatly, but reticulations mostly confined to apical part of fore wing. Length: male 8-9 mm., female, 10-12 mm.

Nymphs may be found in June and July, and are easily recognized by stripes on the pronotum and their long threadlike antennae.

Specimens examined: 247; throughout the state from the first of July until September.

Gyponana tenella (Spångberg)1878. *Gypona tenella* Spångberg. Spec. Gyponae, p. 34.

Shiny green, with relatively few reticulations on the apical portion of fore wing. It is distinguished from *striata* by its smaller size and more slender form. According to Ball and Reeves (1927) it is found on pine. Length: female, 8 mm.

Specimens examined: 3; Willow River and Cloquet; August.

Gyponana rugosa (Spångberg)1878. *Gypona rugosa* Spångberg. Spec. Gyponae, p. 6.

Yellowish green, the fore wing opaque, rugose, shiny; nervures and reticulations prominent. Pronotum usually with a median black spot behind each eye, and a black spot on each hinge. Posterior margin of sternite VII deeply rectangularly notched. Length: male, 9 mm., female, 10 mm.

Specimens examined: 2; Ramsey County; August.

GYPONA Germar

1821. Mag. Ent. 4:38, 73.

GENOTYPE: *Cercopis glauca* Fabricius, 1803. Monobasic.

Very broad and robust species are included in this genus. Crown long and flat, in profile sharply angled with the front, the margin foliaceous. Venation of fore wing constant, with five apical and three anteapical cells.

Ball (1920) reviewed the North American species. Ball and Reeves (1927) and Ball (1935) added new species and notes.

Gypona melanota Spångberg1878. *Gypona melanota* Spångberg. Spec. Gyponae, p. 19.

Female large, broad, pale green, unmarked except a round

black spot on pronotum behind each eye and a spot on each hinge. Male variable, green to black, with the black mostly on head and pronotum, and showing through fore and hind wing from abdomen beneath. Length: male, 8 mm., female, 10 mm.

Specimens examined: 12; Anoka County, Traverse County, North Branch, Big Stone County, Hennepin County, Isanti County (Bradford), and Ramsey County.

PRAIRIANA Ball

1920. Ent. Soc. Amer. Ann. 13:84, 90.

GENOTYPE: *Gypona cinerea* Uhler, 1877. Original designation.

Narrow in form; crown angularly produced, nearly equalling the pronotum in length; in profile flat, the margin with front thin and foliaceous. Gray or brown in color, the fore wing with linear markings or fuscous dots lining the nervures.

Ball (1920) reviewed the species in this genus. Ball and Reeves (1927) and Ball (1935) added notes and described new species.

Prairiana cinerea (Uhler)

1877. *Gypona cinerea* Uhler. U. S. Geol. and Geog. Survey Bul. 3:460.

Dark gray, the nervures of fore wing heavily lined with black dots. Crown obtusely rounded, not as long as pronotum, and with a dark spot behind each ocellus on posterior margin. Crown and pronotum peppered with fuscous dots. Length: male, 6 mm., female, 7 mm.

Specimens examined: 2; Hennepin and Ramsey counties; June and July.

Prairiana kansana Ball

1920. *Gypona* (*Prairiana*) *cinerea* var. *kansana* Ball. Ent. Soc. Amer. Ann. 13:91.

Brownish cinereous, finely peppered with fuscous dots. Crown angulate, as long as pronotum. Length: male, 8 mm.

Specimens examined: 1 male, Polk County, July 5, 1937.

The following specimens differ from the above in their long and narrow form (male, 9 mm., female, 10 mm.). They were thought by the writer to be distinct, but after examining them, DeLong, who is revising the genus, stated (in letter) that they are *kansana* Ball.

Specimens examined: 6; Wilkin County, Breckenridge, and Crookston; July.

PONANA Ball

1920. Ent. Soc. Amer. Ann. 13:84, 93.

GENOTYPE: *Gypona scarlatina* Fitch, 1851. Original designation.

Crown shorter than broad, in profile convex with a slight depression before the margin. The anterior margin may be distinct, but is not foliaceous or produced. Ocelli located in front of middle of crown, farther from each other than from the eyes.

Ball and Reeves (1927) presented a key to the species in this genus and discussed varieties. Additional notes were given by Ball (1935).

Key to Species

- | | |
|--|----------------------|
| 1. Ground color some shade of brown..... | 2 |
| Ground color yellow or green..... | 3 |
| 2. Pronotum unmarked | <i>scarlatina</i> |
| Anterior margin of pronotum with black spots..... | <i>puncticollis</i> |
| 3. Fore wing fulvous brown except for a narrow creamy margin along costa | <i>limbatipennis</i> |
| Black or smoky marking of fore wing reduced to broad band along the commissure | <i>pectoralis</i> |

Ponana scarlatina (Fitch)

1851. *Gypona scarlatina* Fitch. Homop. N. Y. State Cab., p. 57. (Also: 1893. N. Y. State Ent. Rpt. 9:397.)

Brown, the fore wing brownish subhyaline, with scattered dark-brown or reddish-brown transverse reticulations which vary greatly in number. The crown and pronotum unmarked, lacking the scarlet spotting described in eastern examples of this species. Length: male, 9 mm., female, 10 mm.

Specimens examined: 63; Cass, Chippewa, Clearwater, Beltrami, Kittson, Le Sueur, Nicollet, Norman, Polk, and Ramsey counties; June and July.

Ponana limbatipennis (Spångberg)

1878. *Gypona limbatipennis* Spångberg. Spec. Gyponae, p. 47.

Fulvous brown, the fore wing smoky brown, except for a narrow, creamy costal margin. Length: male, 8 mm.

Specimens examined: 1; Le Sueur County, fish hatchery lights; July 23, 1922.

Ponana pectoralis (Spångberg)

1878. *Gypona pectoralis* Spångberg. Spec. Gyponae, p. 46.

Green or yellowish green; an indefinitely margined smoky band extending from scutellum to apex of fore wing. Fore wing often with irregular black dots near middle. Length: 8-10 mm.

Specimens examined: 27; Clearwater, Polk, Red Lake, Olmsted, and Ramsey counties; June and July.

Ponana puncticollis (Spångberg)

1878. *Gypona puncticollis* Spångberg. Spec. Gyponae, p. 54.

Yellowish brown, the fore wing sometimes with a reddish cast; reticulations scant. Pronotum with a pair of black spots behind each eye, a pair near the anterior margin behind ocelli, and a black spot on each hinge. Length: female, 8-9 mm.

Specimens examined: 4; Chisago and Hennepin counties; August.

Subfamily LEDRINAE Stål

1870. *Ledrina* Stål. Svenska Vetensk. Akad. Öfversigt af . . .
Forhandl. 17:731.

XEROPHLOEA Germar

1839. Ztschr. f. Ent. 1:190.

GENOTYPE: *Cercopis viridis* Fabricius, 1794. Monobasic.

Members of this genus are usually uniformly green in color, though the males vary to yellow or brown. The entire dorsal surface distinctly punctate, the punctures bearing minute setae. Fore wing held rooflike, nearly vertical at apex.

Lawson (1931b) discussed the species of this genus in North America.

Xerophloea viridis (Fabricius)

1794. *Cercopis viridis* Fabricius. Ent. Syst. 4:50.

Female light green, often with minute black dots along veins of fore wing. Male yellowish green, rarely gray, usually with a dark longitudinal median line on the crown. Crown angularly produced in front, the margin thin. Length: male, 6.5 mm., female, 7.5 mm.

Specimens examined: 32; Lincoln, Yellow Medicine, Steele, and Ramsey counties; July to September.

Subfamily AMBLYCEPHALINAE China

1939. *Amblycephalinae* China. Ann. and Mag. Nat. Hist.
(Ser. 11) 4:587.

Key to Genera

1. Fore wing reticulate veined at apex..... *Draeculacephala*
Fore wing not reticulate veined at apex..... 2
2. Fore wing exposing sides of abdomen; head and pronotum deflexed,
the crown in profile rounded to front with margin lacking *Cuerna*
Fore wing broader, covering sides of abdomen; head and pronotum
scarcely deflexed; crown in profile meeting front with a margin ... 3

3. Olive green or green in color; dorsal surface of pronotum minutely pustulate **Helochara**
 Variously marked; dorsal surface of pronotum not pustulate 4
4. Crown in profile flat, meeting the front at a sharp angle, the margin usually black lined (Pl. III, Fig. 9A) **Graphocephala**
 Crown in profile convex, the margin obtusely rounded and not black edged 5
5. Appendix and apical cells of fore wing smoky hyaline; crown usually with transverse black bands **Kolla**
 Appendix and apical cells not differing from remainder of fore wing; crown usually with scroll markings and a black spot at apex **Neokolla**

CUERNA Melichar

1924. Mus. Nat. Hungarici Ann. 21:199.

GENOTYPE: *Cercopis lateralis* Fabricius, 1798. Subsequent designation.

Crown obtusely curved anteriorly, convex in lateral view and rounding to the somewhat inflated roughened face. A distinct ledge over the antennal pit. Head wider than pronotum; eyes prominent. Fore wing narrow, the ventral margin of abdomen exposed. Ball (1901) revised the group, then known as *Oncomeptopia*.

Cuernalateralis (Fabricius)

1798. *Cercopis lateralis* Fabricius. Ent. Syst., Suppl. p. 524.

Crown and pronotum black, irrorate with yellow. Fore wing dark red, nervures black, a narrow yellow line running from lower corner of eye along lateral margin of abdomen to the pygofer. Length: 7-8 mm.

Specimens examined: 104; throughout the state, except the southwestern counties; April to September.

Cuernalimbata (Say)

1825. *Tettigonia limbata* Say. Acad. Nat. Sci. Phila. Jour. 4:340. (Also: 1891. Compl. Writ. 2:258.)

Smaller and narrower than *lateralis*. Shining black, except for a white lateral line extending from eye back along abdomen. Length: 7 mm.

Specimens examined: 8; Fort Snelling, Sauk Rapids, and Itasca Park; April to June.

NEOKOLLA Melichar

1926. Mus. Nat. Hungarici Ann. 23:343.

GENOTYPE: *Tettigonia hieroglyphica* Say, 1831. Subsequent designation.

Head somewhat swollen, the eyes not prominent. The antennal ledge is fused with the margin of the crown. Venation of fore wing simple, not reticulate at apex.

Ball (1901) reviewed the species included in this genus which was at that time known as *Tettigonia*. Olsen (1922) also studied this genus (as *Cicadella*).

Neokolla dolobrata (Ball)

1901. *Tettigonia hieroglyphica* var. *dolobrata* Ball. Iowa Acad. Sci. Proc. 8:52.

Shiny black, with ivory markings on crown and pronotum. Scutellum yellow, the basal angles black. Claval suture thinly marked with white. Length: male, 5.5 mm.

Specimens examined: 1; Willmar (Eagle Lake); August 2, 1935.

Neokolla gothica (Signoret)

1854. *Tettigonia gothica* Signoret. Soc. Ent. de France Ann. (Ser. 3) 2:345.

This common species varies from olive to red, but may be easily recognized by the black spot at apex of crown, scroll markings on crown and pronotum, and the dark lined nervures of fore wing. Length: male, 5 mm., female, 5.5 mm.

Specimens examined: 131; throughout the state; May to October.

KOLLA Distant

1908. Fauna British India. Rhynchota 4:223.

GENOTYPE: *Kolla insignis* Distant, 1908. Original designation.

Moderately sized species with a short head, which is distinctly subconical in shape. Lateral areas of front are strongly transversely striated. One species is found in Minnesota.

Kolla bifida (Say)

1831. *Tettigonia bifida* Say. Acad. Nat. Sci. Phila. Jour. 6: 313. (Also: 1891. Compl. Writ. 2:387.)

Green and black. Two transverse black bands on crown, and a black spot in front of each eye. Pronotum margined with black anteriorly, with ivory green posteriorly, a black line adjacent to the latter. Fore wing green, nervures broadly black, the apical cells and appendix smoky hyaline. Length: male, 5.5 mm., female, 6 mm.

Specimens examined: 6; Olmsted, Goodhue, Ramsey, and Le Sueur counties; July.

HELOCHARA Fitch

1851. Homop. N. Y. State Cab., p. 56.

GENOTYPE: *Helochara communis* Fitch, 1851. Monobasic.

Similar in form to members of the genus *Draeculacephala*, but fore wing with prominent veins, no reticulations, three anteapical and five apical cells. Head slightly wider than thorax, broader than long, with sides of face reflexed upon the crown and showing concentric lines.

This genus contains one species which is widespread in North America and commonly collected in Minnesota.

Helochara communis Fitch

1851. *Helochara communis* Fitch. Homop. N. Y. State Cab., p. 56. (Also: 1893. N. Y. State Ent. Rpt. 9:396.)

Deep green, fading to yellowish olive, living specimens being much brighter. Face light, arcuately marked with black in female, usually entirely black in male. Male antenna with a black elongated disc. Length: male, 4.5-5 mm., female, 6 mm.

This species prefers grassy locations in swamps or beside streams. It is collected from early spring to late fall and overwinters as a hibernating adult.

Specimens examined: 1,247; throughout the state.

GRAPHOCEPHALA Van Duzee

1916. Check list Hemiptera, p. 66.

GENOTYPE: *Cicada coccinea* Forster, 1771. Original designation.

Head narrower than the pronotum. Crown angular, rounded anteriorly, in profile flat and strongly angled with front (Pl. III, Fig. 9, 9A). Fore wing long, opaque, and marked with brilliantly colored stripes.

Ball (1901) revised this genus, then known as *Diedrocephala*. Notes and new species were added by Ball (1936e).

Graphocephala coccinea (Forster)

(Pl. III, Fig. 9, 9A)

1771. *Cicada coccinea* Forster. Nov. Spec. Insect., p. 69.

A brilliantly colored species; crown and face yellowish orange, with a black band on the margin between. General color reddish, with prominent green or blue-green stripes on pronotum and fore wing. Length: male, 7-8 mm., female, 8 mm.

Specimens examined: 142; all parts of the state; late June to early October.

DRAECULACEPHALA Ball

1901. Iowa Acad. Sci. Proc. 8:39, 66.

GENOTYPE: *Tettigonia mollipes* Say, 1831. Original designation.

Green or straw-colored, relatively slender in form, and usually with crown acutely angled (Pl. III, Fig. 10). The species are readily separated from related forms by the reticulate venation of the apical half of the fore wing.

Ball (1927) revised this group and gave a key to the North American species. Additional notes by Ball and China (1933) established the identity of many of Walker's types.

Key to Species

- | | |
|--|---------------------|
| 1. Males | 2 |
| Females | 7 |
| 2. Pygofer greatly exceeding plate in length | 3 |
| Pygofer slightly or not at all exceeding plate | 4 |
| 3. Spots at apex of crown small and close together; plate narrowed sharply beyond the middle | angulifera |
| Spots at apex of crown large and not approximate; plate not narrowed near the middle | prasina |
| 4. Plate long and slender, about the same width throughout | paludosa |
| Plates together triangular in shape | 5 |
| 5. Apex of plate with a drawn-out, laterally diverging tip | crassicornis |
| Apex of plate may be folded but not angled laterally | 6 |
| 6. 6 mm. or less in length | mollipes |
| 7 mm. or more in length | minor |
| 7. Margin at apex of crown thin and protruding | 8 |
| Margin at apex rounded, the margin thickened | 10 |
| 8. Large, more than 10 mm., face usually light, the arcs distinct | paludosa |
| Smaller, less than 10 mm., face usually dark, the arcs obscured | 9 |
| 9. Large, more than 8 mm., crown and pronotum broad | minor |
| Smaller, less than 8 mm., crown and pronotum narrow | mollipes |
| 10. Crown longer than pronotum | angulifera |
| Crown about equalling or shorter than pronotum | 11 |
| 11. Apical dots of crown very small and close together; markings in front of eyes linear | crassicornis |
| Apical dots large, separated; markings in front of eye broad | prasina |

Draeculacephala paludosa Ball and China

1933. *Draeculacephala paludosa* Ball and China. Kans. Ent. Soc. Jour. 6:3.

A large species which is easily recognized. Crown about as long as broad, the front in lateral view straight with a definite angle at the base. Plate over three times as long as wide, slender, the tip usually slightly folded dorsally. Posterior margin of sternite VII with a concave curve on each side of a median truncate ridge which is equal to the width of the ovipositor. Length: male, 7.5-8 mm., female, 10-11 mm.

Specimens examined: 245; Chippewa, Cook, Hennepin, Le Sueur, Nicollet, Polk, Ramsey, Wilkin, and Winona counties; July, August, and September.

Draeculacephala mollipes (Say)

1831. *Tettigonia mollipes* Say. Acad. Nat. Sci. Phila. Jour. 6:312. (Also: 1891. Compl. Writ. 2:386.)

A small species, apparently rare in Minnesota. Crown about as long as broad, very sharply angled in front, scarcely longer than pronotum. Pronotum crossed by five bluish or green stripes, which may continue on to the crown and scutellum and are the same color as the nervures. Plates together triangular, slightly constricted near the middle, the apices slightly folded. Length: male, 6 mm.

Specimens examined: 5; Anoka County, Plummer, Taylors Falls, and Ramsey County; August and September.

Draeculacephala angulifera (Walker)

1851. *Tettigonia angulifera* Walker. List Homop. Ins. Brit. Mus. 3:771.

Crown rounding to front, not acutely angled in lateral view; heavily marked with black in male. Plate about half as long as pygofer, the apex slightly folded. Posterior margin of sternite VII arcuated, a small median notch on the slightly produced central portion. Length: male, 7-8 mm., female, 8-9 mm.

Specimens examined: 52; Cass, Polk, Todd, Lake, Cook, Pine, Ramsey, Hennepin, and Carver counties; July and August.

Draeculacephala crassicornis Van Duzee

1915. *Draeculacephala crassicornis* Van Duzee. Ent. News 26:181.

Crown wider than long, the margins rolled, with a black dash in front of each eye and two at the apex. Plates together triangular, the apex of each drawn out into a broad filament which is bent sharply to each side. Apical half of male antenna black and enlarged. Sternite VII sinuate on posterior margin and with a slight notch at the middle. Length: male, 6-6.5 mm., female, 7-7.5 mm.

Specimens examined: 7; Cook County; August 21, 1938.

Draeculacephala prasina (Walker)

1851. *Tettigonia prasina* Walker. List Homop. Ins. Brit. Mus. 3:768.

Resembling *angulifera*, but differs by its shorter and broader crown, and the larger black spot in front of each eye. Crown

shorter than pronotum in both sexes. Plates broadly triangular together, about two thirds the length of pygofer, their outside margins lined with fine hairs. Length: male, 7-8 mm., female, 8-9 mm.

Specimens examined: 362; throughout the state; July and August.

Draeculacephala minor (Walker)

(Pl. III, Fig. 10)

1851. *Tettigonia minor* Walker. List Homop. Ins. Brit. Mus. 3:772.

A very common species in Minnesota, and heretofore confused with *mollipes*. Crown acutely angled, the face in lateral view straight, with a distinct bend near the tip. Face arcuately marked with black in female, distinctly black in male. Plates together triangular, about twice as long as their width at the base, sparsely lined with spines at the outside margins. Length: male, 7-7.5 mm., female, 9-10 mm.

Specimens examined: 4,569; all parts of the state; last of June until the first of September.

Subfamily EVACANTHINAE Baker

1923. *Euacanthidae* Baker. Philippine Jour. Sci. 23:353, 362.

EVACANTHUS LePeletier and Serville

1828. Encyclopédie Méthodique, 10:612.

GENOTYPE: *Cicada interrupta* Linnaeus, 1758. Original designation.

Species in this genus have a distinct median keel on crown and front, the crown also with an additional obscure carina from apex to each eye and enclosing the ocellus (Pl. III, Fig. 15). The pronotum and scutellum are pubescent, other parts with scattered hairs. Fore wing without anteapical cells, shorter than abdomen in females.

Only two species are included in this genus in North America, one of which has been collected in Minnesota.

Evacanthus acuminatus (Fabricius)

(Pl. III, Fig. 15)

1794. *Cicada acuminata* Fabricius. Ent. Syst. 4:36.

Male black, female brown; nervures of fore wing irregularly white, the costal area white near apex. Crown of female with a pair of spots near posterior margin. Anterior margin of pronotum

with two transverse bars divided by a broad black stripe extending from apex of crown to tip of scutellum. Length: male, 5.5 mm., female, 6 mm.

Specimens examined: 3; Cook County, Eagle Bend, and Lutsen; July and August.

Subfamily APHRODINAE Kirkaldy

1906. *Aphrodinae* Kirkaldy. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent. Bul. 1:307.

Key to Genera

1. Four mm. or less in length; fore wing smooth **Xestocephalus**
More than 4 mm. in length; fore wing roughened 2
2. Crown with a median longitudinal carina (Pl. III, Fig. 8) **Aphrodes**
Crown without a median longitudinal carina **Stroggylocephalus**

STROGGYLOCEPHALUS Flor

1861. *Rynchota* Livlands 2:198, 210.

GENOTYPE: *Cicada agrestis* Fallén, 1806. Monobasic.

Crown angulately produced, the dorsal surface longitudinally striate, except where paralleling the anterior margin. Ocelli above a rather sharp margin, only slightly closer to eyes than to apex of crown. Pronotum coarsely transversely striate. Veins of fore wing conspicuous, sparsely margined with pubescence.

Stroggylocephalus agrestis (Fallén)

1806. *Cicada agrestis* Fallén. Svenska Vetensk. Akad. Handl. 27:23.

A puzzling species, varying in color, size, and markings. A constant structural feature seems to be an indentation of the eye next to the antennal pit. Length: male, 6 mm., female, 6.5 mm.

Specimens examined: 6; Hennepin County, Walker, Ramsey County, Mille Lacs County, and Anoka County; April and May.

APHRODES Curtis

1831. Guide Brit. Ins., p. 193.

GENOTYPE: *Cicada albifrons* Linnaeus, 1758. Monobasic.

Crown angular and well produced before the eyes, somewhat depressed before the margin, the ocelli on the margin about midway from eye to apex. Crown usually with a distinct median longitudinal carina (Pl. III, Fig. 8).

Key to Species

- Length less than 5 mm., species dark brown in color **albifrons**
Length 5 mm. or more, species light yellow in color **bicinctus**

Aphrodes bicinctus (Schränk)

1776. *Cicada bicincta* Schränk. Beiträge zur Naturgeschichte, p. 75 (reference not seen).

1781. *Cicada bicincta* Schränk. Enum. Ins. Austria, p. 254.

1781. *Cicada nervosus* Schränk. Enum. Ins. Austria, p. 252.
(nec. *Cicada nervosus* Linn., 1758.)

Yellowish brown, with a contrasting, distinct, yellow transverse band on pronotum. Dorsal surface of crown and pronotum striate. Fore wing opaque, the veins prominent. Length: male, 6 mm.

Specimens examined: 1; Cook County; August 5, 1939.

Aphrodes albifrons (Linnaeus)

(Pl. III, Fig. 8)

1758. *Cicada albifrons* Linnaeus. Syst. Nat. Ed. 10, p. 437.

A small, rather robust, dark-brown species with irregular black markings. Dorsal surface of crown, pronotum, and scutellum finely punctate, the pronotum sometimes transversely striate; fore wing rugose, especially the claval area. Length: female, 4 mm.

According to Osborn (1916) this species is found principally on timothy, living at least part of the time on the crown of the plant. However, Ball (1932a) reported that it feeds on the plantain growing between timothy clumps.

Specimens examined: 3; Hennepin and Ramsey counties; July to October.

XESTOCEPHALUS Van Duzee

1892. Amer. Ent. Soc. Trans. 19:298.

GENOTYPE: *Xestocephalus pulicarius* Van Duzee, 1894. Subsequent designation.

Small, robust species which are elliptical in form. Head subconical, narrower than pronotum, the ocelli on the rounded margin distant from the eyes. Fore wing without an appendix, usually marked with semitransparent yellow or light-brown spots.

Peters (1933) gave a key to the species in this genus and illustrated several of the male genitalia.

Key to Species

1. Species black with a white-marked fore wing **coronatus**
Species brown 2
2. Crown with distinct lines or dots **pulicarius**
Crown without markings **superbus**

Xestocephalus coronatus Osborn and Ball

1897. *Xestocephalus coronatus* Osborn and Ball. Iowa Acad. Sci. Proc. 4:184.

Nearly the same form and size as *pulicarius*, but shiny black with conspicuous white markings on head, pronotum, and fore wing. Length: male, 2.5 mm., female, 3 mm.

Not yet collected in Minnesota. It should be found since it occurs in Iowa and has been reported from Wisconsin.

Xestocephalus pulicarius Van Duzee

1894. *Xestocephalus pulicarius* Van Duzee. Buffalo Soc. Nat. Sci. Bul. 5:215.

Small, brown; the crown marked with yellow spots at apex and next to the eyes, and usually with yellowish lines on the disc. Fore wing dark brown, mottled with yellow or clear spots. Length: male, 2.5 mm., female, 2.75 mm.

Its normal host plant is *Carex vulpinoidea* according to Osborn (1915).

Specimens examined: 3,543; Crookston, Houston County, Cook County, Taylors Falls, Lake County, Grand Marais, Baudette, and Ramsey County; May to August.

Xestocephalus superbus (Provancher)

1890. *Deltocephalus superbus* Provancher. Pet. Faune Ent. Canad. 3:339.

Large, uniformly light brown, without definite markings on crown or pronotum. Length: female, 3.75 mm.

Specimens examined: 5; Ramsey County.

Subfamily DORYDIINAE Van Duzee

1892. *Dorydini* Van Duzee. Amer. Ent. Soc. Trans. 19:297.

Key to Genera

1. Crown with lineate markings..... *Hecalus*
Crown without markings..... 2
2. Some shade of green; crown not greatly prolonged
(Pl. III, Fig. 16)..... *Parabolocratus*
Brown in color; crown greatly prolonged and foliaceous *Dorycephalus*

DORYCEPHALUS Kouchakéwitch

1866. Soc. Ent. Rossica Horae 4:102.

GENOTYPE: *Dorycephalus Baeri* Kouchakéwitch, 1866. Monobasic.

Distinctive species with a very long and flattened head. Crown approximately three times as long as wide, with a distinct longitudinal median carina, and the entire margin thin and foliaceous.

Dorycephalus platyrhynchus Osborn

1894. *Dorycephalus platyrhynchus* Osborn. Canad. Ent. 26: 216.

An elongate form; females light brown; males darker, grayish brown. Length: male, 9 mm., female, 14 mm.

Osborn and Ball (1897) found that this species passes the winter as a nymph. Ball (1932a) added a note on the life cycle.

Specimens examined: 7; Hennepin and Norman counties; June to October.

HECALUS Stål

1864. Soc. Ent. de France Ann. (Ser. 4) 4:65.

GENOTYPE: *Petalocephala Paykulli* Stål, 1854. Subsequent designation.

Crown longer than broad, parabolically rounded anteriorly, the margin sharp and foliaceous. Fore wing much shorter than abdomen in the female, but only slightly shorter in the male. This genus is intermediate between *Dorycephalus* and *Parabolocratius* in the form of the crown.

Hecalus lineatus (Uhler)

1877. *Glossocratus lineatus* Uhler. U. S. Geol. and Geog. Survey Bul. 3:463.

Bright green, with four orange-red stripes extending from apex of crown across pronotum, the median two continued to tip of scutellum. Nervures of fore wing broadly orange, the male with a black band at apex, which extends on to tip of abdomen. Length: male, 6 mm., female, 10 mm.

Reported by Osborn and Ball (1897) on slough grass (*Spartina cynosuroides*) in Iowa.

Specimens examined: 6; Big Stone County, Traverse County, Polk County, Crookston, and Freeborn County; July and August.

PARABOLOCRATUS Fieber

1866. Zool.-Bot. Gesell. Wien, Verhandl. 16:502.

GENOTYPE: *Parabolocratius glaucescens* Fieber, 1866. Monobasic.

Crown about as long as pronotum, parabolically or elliptically produced, with the margin thin and foliaceous in female, but scarcely so in male (Pl. III, Fig. 16). Fore wing short in female, usually reaching to base of pygofer; in the male extending beyond tip of abdomen.

Shaw (1932) revised the group and figured the species. New species were added by DeLong (1938a).

Key to Species

1. Front in profile nearly straight; margin with crown very thin and foliaceous *kansiensis*
 Front in profile inflated; margin with crown relatively thick and not foliaceous 2
2. Species robust; crown broadly rounded, distinctly shorter than pronotum *major*
 Species rather slender; crown somewhat angulately rounded, about the same length as pronotum *viridis*

Parabolocratus kansiensis Shaw

1932. *Parabolocratus kansiensis* Shaw. Kans. Ent. Soc. Jour. 5:47.

Yellowish green, the crown shorter than wide, angulately rounded, the margin with front very thin, foliaceous, and strongly reflexed. Fore wing unicolorous; last abdominal segment exposed in the female; wing exceeding abdomen in the male. Length: male, 5.5-6 mm., female, 8 mm.

According to Shaw (1932) paratype(s) of this species from Lakeland, Minnesota is (are) in the Snow Entomological collection, University of Kansas.

Parabolocratus viridis (Uhler)

(Pl. III, Fig. 16)

1877. *Glossocratus viridis* Uhler. U. S. Geol. and Geog. Survey Bul. 3:462.

Uniformly grass green, the crown of the female parabolic in shape, of the male distinctly angular, a black line often under the margin. Length: male, 5-6 mm., female, 6.5-7 mm.

According to Osborn and Ball (1897) wild oat (*Stipa spartea*) is the normal food plant of this species.

Specimens examined: 152; Ramsey, Pope, Hennepin, Kittson, Lincoln, Clearwater, Wadena, Goodhue, Polk, Cook, and Lake counties; May through August.

Parabolocratus major Osborn

1915. *Parabolocratus major* Osborn. Maine Agr. Expt. Sta. Bul. 238:110.

Uniformly green, sometimes faded to yellowish green; the crown broadly rounded and with a thin margin. Female without a black line under margin, often obscure in the male. Similar to *viridis* but distinctly larger and with a more broadly rounded crown. Length: male, 6-7 mm., female, 7.5-8 mm.

The normal food plant is reported by Osborn (1915) to be *Calamagrostis canadensis*.

Specimens examined: 28; Hennepin, Ramsey, Itasca, Houston, and Mille Lacs counties; May through August.

Subfamily JASSINAE Amyot and Serville

1843. *Jassinæ* Amyot and Serville. Hist. Nat. des Ins., Hemiptères, p. 581.

JASSUS Fabricius

1803. *Systema Rhyngetorum*, pp. 12 and 85.

GENOTYPE: *Jassus nervosus* Fabricius, 1803. Subsequent designation.

Robust species, with head narrower than pronotum. Crown narrowly quadrate, blunt anteriorly, and broadly rounded to the long front, perpendicularly raised at the sides and base (Pl. III, Fig. 11). Ocelli large and situated about halfway from the eye to the median line. Face with transverse striae and an indication of a median carina. Fore wing broadly rounded behind, with one closed anteapical cell, petiolate basally; appendix distinct. Lawson (1927) discussed this genus.

Jassus olitorius Say

(Pl. III, Fig. 11)

1831. *Jassus olitorius* Say. Acad. Nat. Sci. Phila. Jour. 6: 310. (Also: 1891. Compl. Writ. 2:385.)

Brownish, the crown yellowish. Face yellow, usually with two red stripes. Fore wing brown, the nervures darker, in the female transversely crossed by two hyaline bands; in the male darker brown and without bands. Length: male, 6 mm., female, 7 mm.

DeLong (1923) reported sassafras as the food plant of this species.

Specimens examined: 3; Wabasha County, Lake City, and Houston; July and August.

Subfamily ATHYSANINAE Van Duzee

1892. *Athysanini* Van Duzee. Amer. Ent. Soc. Trans. 19: 297, 299.

Key to Genera

1. Genae visible behind eyes in dorsal view (Pl. IV, Fig. 1, 1A). Crown acutely angled, the front long and narrow. Fore wing with reflexed veinlets to costal margin (Pl. VII, Fig. 1).....2
- Genae not visible behind eyes in dorsal view. Crown variable, but front rarely long and narrow. Fore wing with or without reflexed veinlets to costal margin.....3

2. Second cross vein absent; few or no veinlets to costal margin **Japananus**
 Second cross vein present; usually many reflexed veinlets to costal margin **Scaphytopius**
3. Crown acutely angled; in lateral view, flat and meeting front with a rather sharp and distinct margin (Pl. IV, Fig. 2, 2A). Fore wing without second cross vein; with reflexed veinlets to costal margin (*Scaphoideus* and allies) 4
 Species otherwise 7
4. Fore wing with reticulate veinlets along claval suture (Pl. VII, Fig. 7) **Prescottia**
 Fore wing without reticulations along claval suture 5
5. Outer anteapical cells nearly parallel sided to costal margin; without extra veinlets to costal margin (Pl. VII, Fig. 4) **Osbornellus**
 Outer anteapical cell narrowed posteriorly; with supernumerary veinlets to costal margin (Pl. VII, Fig. 5) 6
6. Head and pronotum ivory white or yellowish. Plate narrow and almost as long as pygofer **Lonenus**
 Head and pronotum with fuscous markings. Plate distinctly shorter than the pygofer **Scaphoideus**
7. Fore wing uniformly inscribed with numerous small brown pigment lines (Pl. VI, Fig. 1) 8
 Fore wing variously marked and inscribed otherwise; or without markings 9
8. Crown not produced; anterior margin rounded or acute (Pl. IV, Fig. 13) **Phlepsius**
 Crown produced; anterior margin thin, usually foliaceous at apex (Pl. IV, Fig. 14) **Paraphlepsius**
9. Fore wing with two anteapical cells. Species always macropterous (Pl. VI, Fig. 8) **Macrosteles**
 Fore wing with three anteapical cells. Species usually macropterous but sometimes brachypterous 10
10. Brachypterous; if macropterous the venation usually obscured, sometimes with only two anteapical cells. Ovipositor usually greatly exceeding the pygofer in length 11
 Species rarely brachypterous. Venation conspicuous; three anteapical cells present. Ovipositor normal and little exceeding pygofer 14
11. Usually black, with fore wing opaque. Crown broad and almost parallel margined **Driotura**
 Usually gray, with fore wing subhyaline. Crown angulately produced 12
12. Anterior margin of crown rather sharp, and acutely angled with the front **Doratura**
 Anterior margin of crown obtusely rounded to the front without a sharp margin 13
13. Usually 3 mm. or more in length; crown with a large black spot on either side of the apex. Ovipositor long and slender **Athysanella**
 Species less than 2.75 mm. in length; crown unmarked (except *L. rotunda*) **Lonatura**
14. Crown usually acutely produced or as wide as long. Fore wing with the second cross vein present, the nervures usually distinct (*Deltocephalus* and allies) 15

- Crown usually wider than long. Fore wing without the second cross vein, or, if present, with supernumerary veinlets to costal margin 23
15. Fore wing with a "saddle" pattern; central anteapical cell constricted and divided by two veinlets. Pygofer of female with numerous stout setae **Sanctianus**
- Fore wing without a definite saddle pattern. Pygofer of female usually without numerous stout setae 16
16. Crown flattened and acutely produced; fore wing with strongly reflexed costal veinlets or with two outer apical veinlets short and nearly right-angled to margin 17
- Crown sloping and rounding to the front, usually only obtusely produced; fore wing not as above 19
17. Fore wing with a small but definite appendix (Pl. VII, Fig. 9) **Palus**
- Fore wing without a definite appendix 18
18. Costal veinlets strongly reflexed (Pl. VII, Fig. 3); crown usually longer than its basal width (Pl. IV, Fig. 6) **Flexamia**
- Costal veinlets right-angled (Pl. VII, Fig. 13); crown about the same length as its basal width (Pl. IV, Fig. 3) **Latalus**
19. Usually unicolorous green or yellow; venation simple, the central anteapical cell not greatly enlarged at either end or strongly constricted in middle (Pl. VI, Fig. 2) **Laevicephalus**
- Usually heavily marked with fuscous or black; venation complicated by reticulate veins, the central anteapical cell usually strongly constricted at the middle 20
20. Clavus with numerous reticulate cross veins (Pl. VII, Fig. 2) **Polyamia**
- Clavus with one or two cross veins but not strongly reticulate 21
21. Species relatively robust; crown wide, greatly exceeding its median length (Pl. IV, Fig. 4) **Amplicephalus**
- Species small; crown about as wide as long 22
22. Crown nearly flat, bluntly produced, the ocelli removed from eyes and at a level with disc of crown (Pl. IV, Fig. 5) **Hebecephalus**
- Crown convex, obtusely produced, and evenly rounded to the front, the ocelli close to eyes and below level of disc of crown (Pl. IV, Fig. 9) **Deltocephalus**
23. Head wider than pronotum (Pl. V, Fig. 7); fore wing bright green, opaque except for smoky apex **Opsius**
- Species otherwise 24
24. Crown wider than long, with a more or less transverse depression behind the anterior margin; fore wing with supernumerary or additional veinlets to costal margin, or both (*Platymetopius* and allies) 25
- Crown broadly rounded to front, with no depression behind anterior margin; fore wing without supernumerary or extra veinlets to costal margin 31
25. Species large and stout, 5 mm. or more in length (except *E. tenellus*); crown with a definite transverse furrow behind anterior margin (Pl. V, Fig. 10, 10A); venation simple (Pl. VII, Fig. 12) **Eutettix**
- Smaller and more slender species; furrow on crown less conspicuous or wanting; fore wing usually with reticulations 26

26. Fore wing with vermiculate lines in a saddle pattern, without extra costal veinlets (Pl. VI, Fig. 3) **Norvellina**
 Fore wing without a saddle pattern, usually with extra veinlets at costal margin 27
27. Crown obtusely produced (Pl. IV, Fig. 11); additional veinlets in costal area greatly expanded toward margin (Pl. VI, Fig. 10) **Menosoma**
 Fore wing without expanded veinlets in costal area 28
28. Supernumerary costal veinlets darkly colored 29
 Costal veinlets concolorous with fore wing 30
29. Crown with a transverse furrow behind anterior margin (Pl. V, Fig. 11, 11A); prominent reticulations along claval suture (Pl. VII, Fig. 8) **Aligia**
 Crown flattened, with a black line underneath anterior margin (Pl. V, Fig. 12); reticulations along claval suture obscure or lacking (Pl. VII, Fig. 11) **Mesamia**
30. Crown short, nearly parallel margined (Pl. V, Fig. 8); fore wing with only two extra costal veinlets (Pl. VI, Fig. 4) **Bandara**
 Crown obtusely rounded; fore wing with four or more extra costal veinlets (Pl. VI, Fig. 7) **Platymetopius**
31. Broad species. Crown prominently marked with transverse lines or large spots. Fore wing usually but little exceeding abdomen, with veins heavily infuscated (*Euscelis* and allies) 32
 Slender species. Crown variously banded, spotted, or unmarked. Fore wing usually long and narrow with unicolorous veins (*Thamnotettix* and allies) 40
32. Species 8 mm. or more **Remadosus**
 Species smaller, usually 6 mm. or less 33
33. Crown widely obtuse, with transverse lines or bars or sometimes solid dark color 34
 Crown narrowly obtuse, without markings or with definite spots 35
34. Crown broad, parallel margined (Pl. V, Fig. 3); species elongate wedge-shaped **Limotettix**
 Crown obtusely produced (Pl. V, Fig. 2); species oval and robust **Ophiola**
35. Crown wider than long, nearly parallel margined; in profile obtusely rounded to the front (Pl. V, Fig. 1, 1A) 36
 Crown angulately produced 37
36. Fore wing clear hyaline, nervures dark; ovipositor very long **Exitianus**
 Fore wing milky, nervures light; ovipositor normal **Aithysanus**
37. Broad, stout species, usually brownish. Crown flat; in profile angled to the front with a distinct margin 38
 Small, slender species, usually black or green. Crown obtusely subconical (Pl. V, Fig. 6); in profile convex and rounded to the front 39
38. Species straw-colored. Crown usually with obscured brown spots (Pl. V, Fig. 5); in profile with a thick anterior margin **Euscelis**
 Crown with conspicuous black spots (Pl. V, Fig. 4); in profile with an acute anterior margin **Commellus**
39. Fore wing with black and yellow stripes **Amblysellus**
 Fore wing without conspicuous stripes **Stirellus**

40. Fore wing narrowed and acutely pointed at apex.....**Acinopterus**
Fore wing rounded at apex in normal manner.....41
41. Relatively large, immaculate green or yellow-green species; crown nearly parallel margined; clypellus not constricted (Pl. I).....**Chlorotettix**
Species otherwise42
42. Grass inhabiting; usually yellow green or tawny, with long, slender unmarked fore wing. Crown usually angulate, with small bars or spots near anterior margin.....43
Tree and shrub inhabiting, usually dark, robust species, wedge-shaped; fore wing metallic iridescent or with a highly contrasting pattern. Spots on crown, if present, usually limited to a single pair at apex.....45
43. Small, short species. Crown with small dots near anterior margin (Pl. IV, Fig. 12). Fore wing with central anteapical cell somewhat constricted at middle (Pl. VII, Fig. 6).....**Graminella**
Long, slender species. Crown unmarked or with conspicuous spots or dashes on anterior margin. Fore wing with central anteapical cell scarcely constricted (Pl. VI, Fig. 11).....44
44. Crown unmarked, angulately produced and acutely angled with the front**Elymana**
Crown with bars or spots on the thick anterior margin.....**Cicadula**
45. Crown broadly rounded, nearly parallel margined, comparatively flat in profile**Atanus**
Crown not parallel margined, longer medially than next to the eyes; in profile convex and rounded to the front.....46
46. Crown short and bluntly rounded (Pl. V, Fig. 14). Fore wing without "saddle" marking, showing metallic coloring and red spotting**Idionotus**
Crown obtusely subconical, longer medially than next to the eyes (Pl. V, Fig. 13).....47
47. Species with a "saddle" on fore wing or a "collar" on pronotum, or both. Posterior margin of sternite VII with straplike projection in deep notch. Plates together spoon-shaped.....**Colladonus**
Species otherwise48
48. Fore wing smoky. Posterior margin of sternite VII almost truncate**Thamnotettix**
Crown with traces of scroll markings. Fore wing brownish. Posterior margin of sternite VII concave.....**Doleranus**

JAPANANUS Ball

1931. Canad. Ent. 63:218.

GENOTYPE: *Platymetopius hyalinus* Osborn, 1900. Original designation.

Resembling *Scaphytopius* in the acute shape of the head and the long and narrow front with a "shark's mouth" marking below the margin of the crown. Differs from *Scaphytopius* by the absence of extra veinlets to the costa and the absence of the second cross nervure.

Japananus hyalinus (Osborn)

1900. *Platymetopius hyalinus* Osborn. Ent. News 11:501.

Yellow, the fore wing transparent, with red nervures, crossed by three obscure brownish bars which are blackened on the clavus. Length: female, 5 mm.

An introduced species which is common on maple in the east. Dickerson and Weiss (1919) discussed its life history in New Jersey. This species may spread into Minnesota, for the writer has collected it in Michigan.

SCAPHYTOPIUS Ball

1931. Canad. Ent. 63:218.

GENOTYPE: *Platymetopius elegans* Van Duzee, 1890. Original designation.

Crown well produced and acutely angled; in lateral view flat, angled with the long and narrow front; the margin distinct and with a characteristic white V-shaped line paralleling it below. Genae broad, extending up behind the eyes and visible from above (Pl. IV, Fig. 1, 1A). Fore wing with an appendix, two cross veins, and several reflexed veinlets in the costal area (Pl. VII, Fig. 1).

Van Duzee (1910) revised the species in this group under the generic name *Platymetopius*. Ball (1931c) replaced *Platymetopius* as previously recognized by *Scaphytopius* and other newly described genera. Ball (1932b) discussed their food plants.

Ball's division of the group into several genera is not followed by the writer, and the Minnesota species are here treated as a single genus, *Scaphytopius*.

Key to Species

1. Veins on apical half of fore wing strongly contrasting with the nearly unicolorous basal part..... **angustatus**
Fore wing with whitish dots and fuscous vermiculations on most of basal part..... 2
2. Crown with short lineate markings which together form a transverse band in front of eyes..... 5
Crown with irregular, long, narrow lineate markings..... 3
3. Size 4 mm. or less, greenish gray..... **cinereus**
Size about 5 mm., brown..... 4
4. Dark cuprescent, the whitish spots of fore wing almost obsolete basally; plate about half the length of pygofer and bluntly tipped..... **cuprescens**
Light fulvous, the markings of fore wing distinct; plate long and sharply tipped, but little exceeded by pygofer..... **acutus**
5. Species fulvous brown, face irrorate brown..... **magdalensis**
Dark brown or black, face yellow..... **frontalis**

Scaphytopius angustatus (Osborn)

1905. *Platymetopius angustatus* Osborn. N. Y. State Ent. Rpt. 20:518.

Greenish, the crown with a yellowish tinge and dark longitudinal markings. Fore wing almost unicolorous at base, the veins heavily reticulated with brown at apex, the reflexed veinlets to costa almost obsolete. Length: male, 3 mm., female, 4 mm.

Reported by Ball (1932b) on jack pine in Wisconsin.

Scaphytopius acutus (Say)

(Pl. IV, Fig. 1, 1A; Pl. VII, Fig. 1)

1831. *Jassus acutus* Say. Acad. Nat. Sci. Phila. Jour. 6:306.
(Also: 1891. Compl. Writ. 2:382.)

Face yellow, merging into light fuscous at the margins. Crown fulvous brown, irrorate, and striped with irregular longitudinal yellowish lines. Pronotum brown, usually with five definite white longitudinal lines. Fore wing closely irrorate with brown. Length: male, 4.5 mm., female, 5 mm.

Specimens examined: 703; all parts of the state; June to October.

Scaphytopius cuprescens (Osborn)

1905. *Platymetopius cuprescens* Osborn. N. Y. State Ent. Rpt. 20:517.

Crown long and sharply angled. Face yellow, only a little darkened on the base of front and at the sides. Fore wing with a coppery cast, heavily irrorate with fuscous. Sternite VII carinate posteriorly and with a distinct median notch. Plate rounded at the tip, well exceeded by the pygofer. Length: male, 5 mm., female, 5.5 mm.

Specimens examined: 19; Cass, Clearwater, Chisago, Crow Wing, Cook, and Todd counties during the summer.

Scaphytopius frontalis (Van Duzee)

1890. *Platymetopius frontalis* Van Duzee. Canad. Ent. 22:112.

Crown bluntly pointed, black or dark brown, with short white dashes which together form a transverse line just before the eyes. Pronotum black, usually with five faint longitudinal white lines. Fore wing with several milky white spots, heavily irrorate with black. Length: male, 4 mm., female, 4.5 mm.

Ball (1932b) lists wild blackberry as host of this species.

Not recorded for Minnesota. However, it should be found in the southeastern part of the state since it has been taken in Iowa and Wisconsin and its host occurs in Minnesota.

Scaphytopius cinereus (Osborn and Ball)

1897. *Platymetopius cinereus* Osborn and Ball. Iowa Acad. Sci. Proc. 4:193.

Light gray, the face greenish white. Fore wing olive gray, closely and darkly reticulated. Pronotum gray, usually with five faint longitudinal white lines. Length: male, 3.5-4 mm., female, 4-4.25 mm.

Specimens examined: 42; Ramsey, Houston, Rice, Lincoln, Yellow Medicine, Winona, Hennepin, Anoka, Scott, and Rock counties; late June to middle of September, mostly in September.

Scaphytopius magdalensis (Provancher)

1889. *Platymetopius Magdalensis* Provancher. Pet. Faune Ent. Canad. 3:275.

Face entirely brown, obscurely irrorate with yellow. Pronotum without distinct lines. Sternite VII obtusely rounded behind, angled on either side. Plates together triangular, almost reaching tip of pygofer. Length: male, 4-4.5 mm., female, 4.5-5 mm.

Reported by Ball (1932b) to feed on cranberry.

Specimens examined: 2; Kawishiwi River and Willow River; August.

LONENUS DeLong

1939. Ent. Soc. Wash. Proc. 41:33.

GENOTYPE: *Scaphoideus intricatus* Uhler, 1889. Monobasic.

The single species in this genus is characterized by the long and narrow plates which are almost as long as the pygofer and reach to the tip of the anal tube. Male styles with long narrow attenuated apices. Aedeagus in lateral view with the dorsal portion V-shaped, the posterior arm longer than the anterior arm and enlarged at the apex.

Lonenus intricatus (Uhler)

1889. *Scaphoideus intricatus* Uhler. Md. Acad. Sci. Trans. 1:34.

Ivory white; the crown, pronotum, and scutellum unmarked, sometimes the crown with faint markings. Fore wing pale, veins dark brown, with three milky white spots along the claval suture. Plate as long as the pygofer, sternite VII truncate posteriorly. Length: male, 5 mm., female, 5.5 mm.

Specimens examined: 8; Ramsey County; August.

SCAPHOIDEUS Uhler

1889. Md. Acad. Sci. Trans. 1:33.

GENOTYPE: *Jassus immistus* Say, 1831. Subsequent designation.

Crown angled anteriorly, flat in profile, and acutely angled with the long flat front (Pl. IV, Fig. 2, 2A). Outer anteapical cell of fore wing narrowed posteriorly. Supernumerary veinlets along the costal margin. Claval veins becoming strongly angled at the commissure and appearing "hooked" (Pl. VII, Fig. 5).

DeLong (1939a) reviewed this genus and figured the male genitalia.

Key to Species

1. Fore wing orange red or yellow.....2
Fore wing brown, usually darkly marked with fuscous.....3
2. Small, less than 5 mm. long.....**baculus**
Larger, more than 6 mm. long.....**ochraceous**
3. Size not exceeding 6 mm.; male plates slender, the apices rounded....4
Size exceeding 6 mm.; male plates broad at the base and together triangular in shape.....7
4. Face black.....**melanotus**
Face otherwise, may be dark brown but not black.....5
5. Ventral process of aedeagus in lateral view longer than dorsal portion.....6
Ventral process of aedeagus not exceeding dorsal process in length; posterior margin of sternite VII without a median notch **littoralis**
6. Ventral process of aedeagus narrow, the apex not enlarged....**immistus**
Ventral process broad, the apex enlarged and bluntly pointed....**pullus**
7. Size 6.5 mm., plates together narrower than pygofer at base **carinatus**
Size smaller, plates together as wide as pygofer at base.....**major**

Scaphoideus major Osborn

1900. *Scaphoideus immistus* var. *major* Osborn. Cincinnati Soc. Nat. Hist. Jour. 19:205.

Dark fuscous, the crown with a dark-brown cross band projected slightly forward at middle. Face infuscated, the sutures dark. Plate broad, almost truncate at tip, a little more than half the length of pygofer. Length: male and female, 5.5 mm.

Specimens examined: 6; Itasca Park and Ramsey County; July.

Scaphoideus carinatus Osborn

1900. *Scaphoideus carinatus* Osborn. Cincinnati Soc. Nat. Hist. Jour. 19:201.

Large, brownish gray. Crown with a conspicuous transverse fuscous band which is enlarged anteriorly near the middle. Fore wing strongly marked with fuscous, the cells whitish. Sternite VII with a strong median carina, produced slightly on posterior margin. Length: male and female, 6.5 mm.

Specimens examined: 136; Ramsey County; July.

Scaphoideus immistus (Say)

1831. *Jassus immistus* Say. Acad. Nat. Sci. Phila. Jour. 6: 306. (Also: 1891. Compl. Writ. 2:382.)

Crown yellowish white, with a heavy red band between the eyes which extends to the margin on the median line. Pronotum with an obscure white median line, and a narrow transverse band near anterior margin. Fore wing fuscous brown, with a whitish areolar spot. Length: male, 4.5 mm.

Specimens examined: 8; Ramsey County.

Scaphoideus minor Osborn

1900. *Scaphoideus immistus* var. *minor* Osborn. Cincinnati Soc. Nat. Hist. Jour. 19:205.

Resembling *immistus* in coloration but smaller in size, the face deeply infuscated. Length: male, 4.5 mm.

Specimens examined: 2; Ramsey County; August.

Scaphoideus ochraceous Osborn

1898. *Scaphoideus ochraceous* Osborn. Iowa Acad. Sci. Proc. 5:242.

A light-colored species, tawny ochraceous in general appearance. Crown yellow, with a transverse brownish band which widens near the middle. Fore wing with nervures and reflexed veinlets fuscous, the cells whitish hyaline. Length: male, 5 mm., female, 6 mm.

Specimens examined: 2; Ramsey County.

Scaphoideus melanotus Osborn

1900. *Scaphoideus melanotus* Osborn. Cincinnati Soc. Nat. Hist. Jour. 19:206.

Easily recognized by its black face. Crown with a transverse, narrow brown band. Pronotum whitish with a fulvous band in front and behind, and a fuscous patch on each side. Sternite VII produced, with a notch on the posterior margin. Length: male, 5 mm., female, 5.5-5.75 mm.

Specimens examined: 14; Ramsey County.

Scaphoideus pullus DeLong and Mohr

(Pl. IV, Fig. 2, 2A; Pl. VII, Fig. 5)

1936. *Scaphoideus pullus* DeLong and Mohr. Amer. Midland Nat. 17:969.

Dark fuscous, the crown pale brown with a narrow transverse reddish-brown band. Face usually pale brown with conspicuous arcs, but may be unmarked. Fore wing heavily infuscated, with a few pale spots. Length: male, 4.5 mm., female, 5-5.25 mm.

Although this species may be confused with *littoralis*, it usually can be separated by darker color and slight production of the posterior margin of sternite VII. Often collected at lights.

Specimens examined: 537; throughout the state; July and August.

Scaphoideus littoralis Ball

1932. *Scaphoideus littoralis* Ball. Wash. Acad. Sci. Jour. 22:15.

Tawny, the fore wing with an opalescent tinge. Nervures of fore wing rusty brown; two lobate ivory spots on the commissure and ivory spots on the claval suture. Face always pale, sometimes slightly smoky in female, with faint dark bands at margin with crown. Length: male, 5-5.25 mm., female, 5.75 mm.

Apparently not as numerous as *pullus*, and more limited to the southern part of the state.

Specimens examined: 376; Cass, Carlton, Mille Lacs, Chipewea, Ramsey, Dakota, and Lyon counties; July and August.

Scaphoideus baculus DeLong and Mohr

1936. *Scaphoideus baculus* DeLong and Mohr. Amer. Midland Nat. 17:970.

Tawny red, with traces of white on margin of crown, the anterior portion of pronotum, and at apex of scutellum. Fore wing brownish red, with but few areolar spots. Length: male, 4.75 mm., female, 5 mm.

Specimens examined: 106; Ramsey County; August.

OSBORNELLUS Ball

1932. Wash. Acad. Sci. Jour. 22:10, 17.

GENOTYPE: *Scaphoideus auronitens* Provancher, 1889. Original designation.

Head slightly narrower than pronotum, the crown angled, nearly flat in profile, and meeting the long and narrow front in an acute angle. Fore wing without the second cross vein, the outer anteapical cell not narrowed posteriorly, its margins parallel with the costa, and with a single veinlet at each end reflexed to the costa (Pl. VII, Fig. 4). Plate narrowed into a posterior filamentous or plumose process.

Beamer (1937) reviewed this genus for North America and figured the male genitalia. New species from the southwest have been described by DeLong and Beery (1937) and DeLong and Knull (1941). DeLong (1941a) discussed the three red-banded species of the *auronitens* group and figured the male genitalia.

Key to Species

1. Crown marked with orange.....2
Crown without orange markings.....consors
2. A transverse orange band on crown.....auronitens
Two longitudinal orange bands on crown.....jucundus

Osbornellus auronitens (Provancher)

(Pl. VII, Fig. 4)

1889. *Scaphoideus auronitens* Provancher. Pet. Faune Ent. Canad. 3:277.

Burnt yellow; fore wing hyaline, the nervures light brown, the reflexed costal veinlets dark. A bright orange band traversing the crown slightly in front of eyes; margin between crown and front bordered by black lines. Posterior margin of sternite VII with a deep median notch. Length: male, 5 mm., female, 5.5 mm.

Specimens examined: 80; Chippewa, Ramsey, Le Sueur, Kittson, Hennepin, and Polk counties. Beamer (1937) recorded specimens from Itasca Park.

Osbornellus consors (Uhler)

1889. *Scaphoideus consors* Uhler. Md. Acad. Sci. Trans. 1:36.

Brown, the crown scrolled with dark fuscous lines, with the area between light in color. Posterior margin of sternite VII flattened on the median third, and with a small median notch. Length: male, 4.75 mm., female, 5 mm.

Specimens examined: 36; Olmsted County, Itasca Park, Taylors Falls, Willow River, Lake County, Becker County, Cass Lake, and Ramsey County; June to August. Beamer (1937) recorded specimens from Willow River.

Osbornellus jucundus (Uhler)

1889. *Scaphoideus jucundus* Uhler. Md. Acad. Sci. Trans. 1:34.

Tawny, the crown with a pair of longitudinal reddish spots, and a black line under the margin with the front. Fore wing orange hyaline, with milky white spots. Length: female, 6 mm.

Specimens examined: 1; Ramsey County.

PRESCOTTIA Ball

1932. Wash. Acad. Sci. Jour. 22:10, 16.

GENOTYPE: *Scaphoideus lobatus* Van Duzee, 1894. Original designation.

Head narrower than pronotum, the crown angularly produced, in profile concave to the rather sharp margin and acutely angled

with the front. Fore wing with supernumerary veinlets along the costa and reticulations along the claval suture. Outer anteapical cell with its margins parallel with the costa and not narrowed apically as in *Scaphoideus* (Pl. VII, Fig. 7).

DeLong (1941b) discussed this genus and figured the male genitalia.

Prescottia lobata (Van Duzee)

(Pl. VII, Fig. 7)

1894. *Scaphoideus lobatus* Van Duzee. Buffalo Soc. Nat. Sci. Bul. 5:211.

Yellowish white, the crown and pronotum darkly mottled. Fore wing white, darkly marked with fuscous. Sternite VII nearly truncate posteriorly, with a faint median notch. Plate narrowed to a slender tip, fringed with long white hairs. Length: male, 5 mm., female, 6 mm.

Specimens examined: 27; Hallock and St. Paul; August.

SANCTANUS Ball

1932. Wash. Acad. Sci. Jour. 22:10.

GENOTYPE: *Jassus sanctus* Say, 1831. Original designation.

Crown angularly produced about as long as wide, flat in profile, and meeting the slender front with a margin. Lateral margin of pronotum very short. Fore wing with a distinct appendix; second cross vein present; second anteapical cell constricted and divided; a reflexed vein usually in the costal margin and frequently extra veinlets in the clavus and the anteapical cells.

Not yet known in Minnesota, but the genotype, *Sanctanus sanctus* (Say) is known from Iowa and it may be found here. Oman (1934) presented a key to the species of this genus.

FLEXAMIA DeLong

1926. Ohio State Univ. Studies 2:20, 22.

GENOTYPE: *Deltocephalus reflexus* Osborn and Ball, 1897. Original designation.

Crown strongly produced, in profile sharply angled with the front (Pl. IV, Fig. 6). Fore wing without an appendix, the apical costal veinlets white, strongly reflexed, and margined anteriorly with fuscous; outer apical cell usually margined posteriorly with fuscous (Pl. VII, Fig. 3).

Species in this group were reviewed by DeLong (1926a) and DeLong and Sleesman (1929). Additional species which have been described since are listed by DeLong and Caldwell (1937c).

Key to Species

1. Crown definitely longer than the width between the eyes.....2
Crown as broad as long, or but slightly longer than the basal width.....7
2. Plates almost parallel margined; sternite VII with four pectinate teeth
on posterior margin.....**pectinata**
Species otherwise3
3. Male pygofer constricted near the middle, the narrowed portion then
exceeding the plate by its length; posterior margin of sternite VII
produced into a wide truncate process, incised medially, and con-
cave on each side to form four small teeth.....**abbreviata**
Species otherwise4
4. Length more than 4 mm.; plate as long as pygofer, evenly curved from
base to narrowed tip; posterior margin of sternite VII slightly
emarginate medially, and with a shallow incision.....**reflexa**
Usually less than 4 mm.; plate less than length of pygofer; sternite
VII otherwise5
5. Posterior margin of sternite VII produced into a median triangular
lobe with a small notch at the center; plates abruptly narrowed
and produced into strongly divergent tips.....**sandersi**
Species otherwise6
6. Prominent ventral keel of pygofer separating plates at tips; median
lobe on posterior margin of sternite VII without a median
notch**flexulosa**
Plates not separated by a keel; median lobe of sternite VII with a
median notch**imputans**
7. Species milky white; pronotum with dark longitudinal stripes.....**albida**
Species yellowish to fuscous; no prominent stripes on pronotum8
8. Plate truncate; posterior margin of sternite VII with a sharp median
tooth notched in the center.....**stylata**
Plate narrowed to an acute tip; posterior margin of sternite VII with
a broad, notched median lobe.....**inflata**

Flexamia sandersi (Osborn)

1907. *Deltocephalus sandersi* Osborn. Davenport Acad. Sci.
Proc. 10:164.

Yellowish gray. Posterior margin of sternite VII medially pro-
duced into a tooth slightly incised at the middle. Plates broad at
the base, rapidly narrowed for two thirds their length, then ab-
ruptly curved outward to divergent, acutely pointed apices.
Length: 4 mm.

Specimens examined: 2; Taylors Falls; August 2, 1925.

Flexamia reflexa (Osborn and Ball)

1897. *Deltocephalus reflexus* Osborn and Ball. Iowa Acad.
Sci. Proc. 4:203.

Pale cinereous above, with fuscous markings on crown and
faint indications of lines on pronotum. Posterior margin of ster-
nite VII broadly rounded into a median tooth, notched in the

center, and margined with black on either side of the notch. Plates long and equalling pygofer in length, the tips slightly divergent. Length: 4-4.5 mm.

This is the most abundant species of the group; DeLong (1926a) recorded specimens from Minnesota. However, this species is not represented in the Minnesota collection.

Flexamia imputans (Osborn and Ball)

1898. *Deltocephalus imputans* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:75.

Creamy yellow, tinged with olive, the fuscous markings restricted to spots at apex of crown and the bordering of reflexed veins of fore wing. Length: 3.5-4 mm.

Known in Iowa and Wisconsin; should be found in Minnesota.

Flexamia flexulosa (Ball)

1899. *Deltocephalus flexulosus* Ball. Canad. Ent. 31:189.

Pale cinereous, the face fuscous above, pale yellow below. Posterior margin of sternite VII slightly excavated on each side of a median wedge-shaped tooth with the apex sometimes notched in the middle. Plates sloping to rounded tips, excavated on median line about one third the length from tip of valve to expose sharp ventral keel of pygofer. Length: male and female, 4.25 mm.

Specimens examined: 1; Climax; July 8, 1935.

Flexamia pectinata (Osborn and Ball)

1897. *Deltocephalus pectinatus* Osborn and Ball. Iowa Acad. Sci. Proc. 4:205.

Pale cinereous; the fore wing slightly shorter than abdomen. Sternite VII slightly concave posteriorly, bearing four teeth, the inner two rounded, the outer ones pointed; plate almost parallel margined; bluntly rounded near the apex to an almost truncate tip, slightly exceeded by pygofer. Length: 3.5-4 mm.

This species is reported to be widely distributed in the upper Mississippi Valley, and is recorded in Iowa and Wisconsin, but not yet collected in Minnesota.

Flexamia abbreviata (Osborn and Ball)

(Pl. IV, Fig. 6; Pl. VII, Fig. 3)

1897. *Deltocephalus abbreviatus* Osborn and Ball. Iowa Acad. Sci. Proc. 4:206.

Our smallest species. Pale cinereous, face infuscated. Crown with two black arcs at apex, indistinct transverse bands near the

middle, and faint dashes near posterior margin which extend across pronotum and scutellum. Posterior margin of sternite VII produced into a black median truncate lobe, incised at the middle, and slightly arcuate on either side. Pygofer of male narrowed and produced beyond plates. Length: male and female, 3.25 mm.

Specimens examined: 6; on *Bouteloua hirsuta* Lag.; Stillwater; July 4, 1940.

Flexamia stylata (Ball)

1899. *Deltocephalus stylatus* Ball. Canad. Ent. 31:190.

Pale cinereous; crown yellowish, with two small black crescents at apex and a pair of transverse fuscous lines between anterior margins of eyes; fore wing pale, the nervures margined with fuscous. Posterior margin of sternite VII produced into an obtusely triangular tooth, incised medially, and with a small lateral tooth at about the middle of each side. Plate half the length of the inflated pygofer, its apex almost truncate. Length: 4.5 mm.

Described from Iowa, and although not yet collected in Minnesota it should be found.

Flexamia inflata (Osborn and Ball)

1897. *Deltocephalus inflatus* Osborn and Ball. Iowa Acad. Sci. Proc. 4:202.

Grayish yellow, with transverse fuscous bars on crown before the eyes and dashes near posterior margin which extend across pronotum and scutellum. Posterior margin of sternite VII with a broad median produced portion, notched in the center, bearing a black spot and a slight tooth on the sloping sides. Male pygofer enlarged, the last tergite inflated and as long as the plate. Length: 4.5 mm.

Not in the Minnesota collection, but it is found in Iowa and Wisconsin and should occur here.

Flexamia albida (Osborn and Ball)

1897. *Deltocephalus albidus* Osborn and Ball. Iowa Acad. Sci. Proc. 4:201.

Large, milky white, conspicuously marked with two longitudinal brown stripes extending from posterior margin of crown across pronotum and scutellum, and with additional stripes at each side of pronotum. Crown with a transverse brown band near the middle, and a brown triangle enclosing the pale area at apex. Length: male, 4.25 mm., female, 4.75 mm.

Specimens examined: 7; Traverse County.

LATALUS DeLong and Slesman

1929. Ent. Soc. Amer. Ann. 22:87.

GENOTYPE: *Amblycephalus sayii* Fitch, 1851. Original designation.

Crown angulate, about as long as its basal width; in lateral view slightly sloping and meeting the front in an acute angle but without a sharp margin (Pl. IV, Fig. 3). Fore wing not exceeding abdomen in length, with short outer apical veinlets meeting the costa at right angles (Pl. VII, Fig. 13).

DeLong and Slesman (1929) discussed the species of this genus. Beamer and Tuthill (1934) added additional species.

Key to Species

1. Size more than 4 mm. **configuratus**
Size smaller 2
2. Fore wing with white patches giving a banded appearance 3
Fore wing without strongly contrasting white patches 4
3. Median length of crown less than the width between the eyes; sternite VII with two blackened broad teeth on posterior margin; fore wing not distinctly banded **sobrinus**
Median length of crown equal to or greater than the width between the eyes; sternite VII shallowly concave; fore wing usually with two pale transverse bands **sayii**
4. Posterior margin of sternite VII with a deep incision on either side of the broad median tooth; plates longer than pygofer, divergent at the tips **latidens**
Sternite VII without an incision; plates short, with blunt rounded tips not divergent **missellus**

Latalus configuratus (Uhler)

1878. *Deltocephalus configuratus* Uhler. U. S. Geol. and Geog. Survey Bul. 4(2):511.

Dull white to gray; crown irregularly overlaid with orange or dull brown, the median line usually distinctly white. Posterior margin of sternite VII with a long pointed tooth on the middle, usually bifid and blackened. Plate gradually sloping along the outer margin, the inner margin diverging apically and rounding to the outer apex. Length: male, 4 mm., female, 4.5 mm.

Specimens examined: 8; Itasca Park, St. Anthony Park, Olmsted County, Fort Snelling, Rochester, Warren, and Traverse County; June and July.

Latalus sobrinus DeLong and Slesman

1929. *Latalus ocellaris* var. *sobrinus* DeLong and Slesman. Ent. Soc. Amer. Ann. 22:100.

Yellowish brown, marked with fuscous. Crown with four spots forming a white cross, sometimes obscured in faded speci-

mens. Fore wing brown, mottled with white. Plates as long as their combined basal widths, narrowed to bluntly pointed tips. Sternite VII produced at the posterior margin into two blackened, broadly rounded teeth, separated by a small notch. Length: male, 3.5 mm., female, 3.75 mm.

Specimens examined: 2; Cook County; August 5, 1939.

Latalus sayii (Fitch)

1851. *Amblycephalus sayii* Fitch. Homop. N. Y. State Cab., p. 61. (Also: 1893. N. Y. State Ent. Rpt. 9:401.)

Pale yellowish to gray, with four spots on crown, the anterior pair triangular, the posterior pair irregular. Fore wing dull gray to brown, usually conspicuously marked by two light transverse bands. Sternite VII with lateral angles rounded, the posterior margin shallowly concave. Plates slightly narrowed from the base to near the apices, then sharply rounded to the inner apices. Length: male, 3.75 mm., female, 4 mm.

A northern species which should be collected in Minnesota but not yet recorded.

Latalus missellus (Ball)

(Pl. IV, Fig. 3; Pl. VII, Fig. 13)

1899. *Deltocephalus missellus* Ball. Canad. Ent. 31:191.

Pale cinereous, the crown with four brownish-orange spots, aligned so as to form a white cross. Nervures of fore wing pale, irregularly margined with fuscous. Posterior margin of sternite VII rounded on middle half, the sides shallowly concave to lateral angles. Plates broad at base, gradually narrowed to broadly, bluntly rounded apices. Length: male, 3 mm., female, 3.25-3.5 mm.

Specimens examined: 76; throughout the state; June to September.

Latalus latidens (Sanders and DeLong)

1919. *Deltocephalus latidens* Sanders and DeLong. Ent. Soc. Amer. Ann. 12:234.

Resembling *missellus*, but larger and with distinctive genitalia. Posterior margin of sternite VII incised deeply on each side of a broad median truncate tooth. Plates slightly longer than their combined basal width, the inner margins strongly divergent from about the middle to the blunt tips. Length: 3 mm.

Not recorded in Minnesota, but described from Wisconsin and it probably will be found here.

PALUS DeLong and Slesman

1929. Ent. Soc. Amer. Ann. 22:85.

GENOTYPE: *Deltocephalus delector* Sanders and DeLong, 1919.
Original designation.

Relatively small, slender species with a characteristic fore wing pattern. Crown angulate, nearly flat in lateral view, meeting the front acutely but without a sharp margin. Fore wing narrow, longer than abdomen, with a small but definite appendix; two or three slightly reflexed costal veins heavily margined anteriorly with fuscous; inner apical cell with a conspicuous fuscous spot; other apical cells narrowly margined posteriorly with black (Pl. VII, Fig. 9). Posterior margin of sternite VII sinuately concave to a shallow notch, at each side of which is a black spot. Plate shorter than pygofer, gradually narrowed from the base to the truncate apex, slightly rounded on outside margin, characteristically blackened on apical third, except at the margins.

DeLong and Slesman (1929) discussed the genus. New species have been added by Beamer (1938).

Key to Species

- | | |
|---|----------------------|
| 1. Crown without black markings..... | <i>luteocephalus</i> |
| Crown with markings..... | 2 |
| 2. Size less than 3.5 mm..... | <i>delector</i> |
| Size more than 3.5 mm..... | 3 |
| 3. Longitudinal orange lines of crown narrowly bordered with thin black lines | <i>marginatus</i> |
| Black markings of crown more extensive..... | 4 |
| 4. Crown with two isolated black spots at apex; a pair of heavily darkened stripes extending across crown, pronotum, and onto scutellum | <i>acutus</i> |
| Crown without spots at apex; darkened stripes not crossing pronotum | <i>fasciatus</i> |

Palus delector (Sanders and DeLong)

1919. *Deltocephalus delector* Sanders and DeLong. Ent. Soc. Amer. Ann. 12:233.

Crown white, with a pair of longitudinal tawny bands from apex, crossing the pronotum, and onto the scutellum. At the apex each band is overlaid by a black triangular spot behind which is a curved black mark. Easily recognized by its small size and characteristic marking. Length: male and female, 3.5 mm.

Specimens examined: 2; Ramsey County.

Palus acutus Beamer

1938. *Palus acutus* Beamer. Canad. Ent. 70:226.

Tawny, resembling *delector*, but larger and more darkly

marked. Crown with a pair of black triangular spots at apex; posterior to these a pair of V-shaped black spots which continue across crown, pronotum, and onto the scutellum as two tawny lines. Length: female, 4 mm.

Specimens examined: 1; Ramsey County.

Palus marginatus (DeLong)

(Pl. VII, Fig. 9)

1918. *Deltocephalus marginatus* DeLong. Ohio Jour. Sci. 18: 228.

A pair of burnt orange bands extending longitudinally from apex of crown across pronotum and ending on scutellum. Inner margin of each band on the crown bordered by a narrow black or dark brown line, broken into spots at apex; sometimes the bands slightly spotted laterally. Length: male and female, 4 mm.

Specimens examined: 167; Ramsey County.

Palus fasciatus Beamer

1938. *Palus fasciatus* Beamer. Canad. Ent. 70:228.

Crown white, with two longitudinal brown stripes extending from apex across pronotum and onto scutellum; the stripes on the crown are heavily overlaid with black, and usually a comma-shaped dark spot partially surrounds each ocellus; a marginal black line next to the face. Length: male, 4-4.25 mm., female, 4.5-4.75 mm.

Specimens examined: 13; Ramsey County; July.

Palus luteocephalus (Sanders and DeLong)

1917. *Deltocephalus luteocephalus* Sanders and DeLong. Ent. Soc. Amer. Ann. 10:84.

Pale yellow to white; crown immaculate, except for the medium suture which is sometimes narrowly black on the basal half. Length: male, 3.75 mm., female, 4 mm.

Specimens examined: 11; Crookston, Eagle Bend, Mora, and Ramsey County; June and July.

POLYAMIA DeLong

1926. Ohio State Univ. Studies 2:20, 46.

GENOTYPE: *Deltocephalus weedi* Van Duzee, 1892. Original designation.

Dark colored species; fore wing heavily marked with fuscous. Crown bluntly angled, in profile sloping and bluntly angled with the front (Pl. IV, Fig. 7, 7A). Fore wing with the central antepical cell divided, the clavus strongly reticulated along the suture by broad veins (Pl. VII, Fig. 2).

A review of this genus was given by DeLong (1926a) and DeLong and Slesman (1929). Additional species described are listed by DeLong and Caldwell (1937c).

Key to Species

1. Length usually more than 4 mm. **inimica**
 Length usually less than 4 mm. 2
2. Crown immaculate yellow; fore wing reddish brown with apices
 whitish or yellowish hyaline. **apicata**
 Species otherwise 3
3. Crown acutely angled, the median length greater than the width at
 the eyes **weedi**
 Crown bluntly angled, wider between the eyes than the length at the
 middle 4
4. Usually 3 mm. or more; fore wing usually longer than abdomen;
 posterior margin of sternite VII convexly rounded; plate shorter
 than pygofer **obtecta**
 Usually less than 3 mm.; fore wing about equal in length to the
 abdomen; sternite VII with a slight median lobe; plate as long
 as pygofer **compacta**

Polyamia weedi (Van Duzee)

1892. *Deltocephalus weedi* Van Duzee. Amer. Ent. Soc. Trans. 19:306.

Yellowish, marked with fuscous. Crown bluntly angled, with two pairs of black spots and an irregular transverse band between the anterior margins of eyes. Brown markings on anterior margin of pronotum and in basal angles and apex of scutellum. Sternite VII with posterior margin evenly concave. Plates short, broadly triangular together, exceeded slightly by pygofer. Length: 3 mm.

A common grass species, found in Iowa but not yet recorded from Minnesota.

Polyamia oblecta (Osborn and Ball)

1898. *Deltocephalus oblectus* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:78.

Grayish, marked with fuscous. Crown with a pair of spots at apex, and one on either side of the apex midway to the eye; also with an irregular fuscous transverse band widened medially, interrupted, and with a black spot posterior to it. Pronotum irregularly olive-marked, and with black spots on the anterior margin. Sternite VII almost truncate at the posterior margin. Plate about half the length of the pygofer, strongly narrowed to the sharp tip. Length: female, 3.5 mm., male, 3.25 mm.

Specimens examined: 1; Ramsey County.

Polyamia compacta (Osborn and Ball)

1897. *Deltocephalus compactus* Osborn and Ball. Iowa Acad. Sci. Proc. 4:217.

Crown yellowish, with an irregular transverse fuscous band between the eyes, and four spots at the anterior margin. Posterior margin of sternite VII strongly medially produced into a rounded lobe. Plate slightly longer than the pygofer, sharply narrowed to an attenuated tip. Length: male and female, 3 mm.

Specimens examined: 2; Taylors Falls and Owatonna; June to August.

Polyamia apicata (Osborn)

1900. *Deltocephalus apicatus* Osborn. Canad. Ent. 32:285.

Crown and anterior half of pronotum yellow. Fore wing dark brown, the apex white or yellowish. A species easily separated by its coloration. Length: male, 3 mm., female, 3.25 mm.

Panicum huaechuchae is its usual food plant according to Osborn (1915).

The writer collected this species from grass in Washington County, July 4, 1940. Three pairs put in Minnesota collection.

Specimens examined: 8; Ramsey County.

Polyamia inimica (Say)

(Pl. IV, Fig. 7, 7A; Pl. VII, Fig. 2)

1831. *Jassus inimicus* Say. Acad. Nat. Sci. Phila. Jour. 6:305.
(Also: 1891. Compl. Writ. 2:382.)

Brownish yellow. Easily recognized by a pair of black spots midway between the apex of the crown and the eye, a pair of black round spots on the anterior margin of the pronotum, and the black at the basal angles of the scutellum. Fore wing grayish, nervures white, margined with fuscous. In some specimens, the color is faded to dirty yellow, but the black spots are usually present. Length: male, 4 mm., female, 4.5 mm.

Commonly found on bluegrass, and recorded from many other host plants. An examination of the internal male genitalia of the Minnesota specimens showed that the pattern is similar to that of *montana* DeLong and Slesman (1929), but externally the specimens are more typical of *inimica*.

Specimens examined: 174,960; throughout state; May-October.

HEBECEPHALUS DeLong

1926. Ohio State Univ. Studies 2:20, 58.

GENOTYPE: *Deltocephalus signatifrons* Van Duzee, 1892. Original designation.

Darkly colored species with conspicuous fuscous patterns. Fore wing with the central anteapical cell strongly constricted at the middle. Crown angled anteriorly, in profile flat, bluntly angled with front (Pl. IV, Fig. 5).

DeLong (1926a) and DeLong and Slesman (1929) reviewed this group. A more recent revision by Beamer and Tuthill (1935) is available. Still other new species have been described and are listed by DeLong and Caldwell (1937c).

Key to Species

Species less than 3 mm., posterior margin of sternite VII almost truncate **cruciatus**
 Species over 3 mm., sternite VII with broad median notch **rostratus**

Hebecephalus rostratus Beamer and Tuthill

(Pl. IV, Fig. 5)

1935. *Hebecephalus rostratus* Beamer and Tuthill. Kans. Univ. Sci. Bul. 22:534.

Cinereous with fuscous markings. Crown with a pair of oblique fuscous dashes on apex, another rectangular pair on disc, more or less suffused with orange. Sternite VII with posterior margin rounded on each side of a broad median notch. Plate almost straight to truncate apex. Length: male, 3.25 mm., female, 3.75 mm.

Specimens examined: 188; Haydenville, Norman County, Kittson County, Lancaster, Argyle, Itasca Park, and Ramsey County; June to September.

Hebecephalus cruciatus (Osborn and Ball)

1898. *Deltocephalus cruciatus* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:77.

Light grayish with brown markings. Brown spots on crown between a median and two transverse yellowish lines. Pronotum irregularly brown-mottled, with five light longitudinal stripes. Fore wing grayish, the nervures broadly white, margined with fuscous. Posterior margin of sternite VII straight, slightly crinkled, and blackened on median half. Plate broad at base, narrowed to truncate tip. Posterior margin of pygofer with a sharp hook on ventral angle.

Specimens examined: 1; Polk County; July 4, 1936.

LAEVICEPHALUS DeLong

1926. Ohio State Univ. Studies 2:21, 64.

GENOTYPE: *Deltocephalus sylvestris* Osborn and Ball, 1897. Original designation.

Usually green or yellowish species with few markings. Crown angularly produced, in profile flat and sharply angled with the front, the margin slightly rounded (Pl. IV, Fig. 8, 8A). Fore wing with central anteapical cell not closed at the middle, though it may be slightly constricted (Pl. VI, Fig. 2).

The species in this genus were discussed by DeLong (1926a). The great number of additional species described since are listed by DeLong and Caldwell (1937c). Oman (1937) discussed the species of the *cinerosus* group of this genus.

Key to Species

1. Size less than 3 mm. 2
 Size 3 mm. or more 3
2. Crown bluntly angled, but little longer medially than the width at base **minimus**
 Crown sharply angled, distinctly longer than the basal width **melsheimerii**
3. Size 3.5 mm., a pair of brown stripes extending from apex of crown onto scutellum, and additional stripes to each side on pronotum 4
 Species otherwise 5
4. Two dorsal black spots on tip of abdomen **shingwauki**
 Dorsal black spots absent **plagus**
5. Crown sharply angled, longer medially than the basal width; slender species, about 3.5 mm. 6
 Crown broadly, roundly angled, basal width more than the median length; usually broad species, 4 mm. or more 8
6. Crown distinctly blunted apically; posterior margin of sternite VII sinuated by three small lobes; plate abruptly tapered to the attenuated tip **unicoloratus**
 Crown sharply acute; genitalia otherwise 7
7. Species usually 3.5 mm.; posterior margin of sternite VII truncate on median third; plates with broad, divergent apices **sylvestris**
 Species usually 4 mm.; sternite VII with a broad median tooth; plate with a narrow, pointed tip **acus**
8. Species slender, 4 mm. or less; fore wing usually yellowish hyaline, with the nervures fuscous margined 9
 Species robust, 4 mm. or more; fore wing greenish subopaque with nearly concolorous nervures 10
9. Posterior margin of sternite VII with a shallow median notch blackened at each side; plate much longer than valve, narrowed to a sharp apex **incisurus**
 Sternite VII nearly truncate; plate only slightly exceeding the valve, nearly truncate apically **affinis**
10. Fore wing long and narrow; sternite VII with a median straplike blackened process **flavo-virens**
 Fore wing short; species broad; genitalia otherwise 11
11. Crown with three pale longitudinal stripes, one at the middle, the others across the ocelli **collinus**
 Without markings across the crown 12

12. Sternite VII produced medially at the posterior margin; plate evenly narrowed to the nearly truncate tip, much shorter than pygofer *uhleri*
 Posterior margin of sternite VII concave and with a median process; plates appearing trilobate *abdominalis*

Laevicephalus minimus (Osborn and Ball)

1897. *Deltocephalus minimus* Osborn and Ball. Iowa Acad. Sci. Proc. 4:211.

Small, greenish yellow, sometimes with traces of arcs on each side of crown. Posterior margin of sternite VII roundly produced, with a blackened tooth at each side of a median incision. Plate nearly as long as pygofer, convexly tapering from base to pointed tip; black spot on disc. Length: male, 2.5 mm., female, 2.75 mm.

Found in Iowa and Wisconsin, but not yet recorded in Minnesota where it should occur.

Laevicephalus melsheimerii (Fitch)

1851. *Amblycephalus melsheimerii* Fitch. Homop. N. Y. State Cab., p. 61. (Also: 1893. N. Y. State Ent. Rpt. 9:401.)

Pale yellowish, resembling *minimus*, but with a more sharply angled crown. Posterior margin of sternite VII with a shallow black-bordered excavation. Plate only slightly narrowed to the broadly rounded, almost truncate tip. Length: male, 2.5 mm., female, 2.75 mm.

A common species on grasses, and it should be collected in Minnesota, although not yet recorded.

Laevicephalus unicoloratus (Gillette and Baker)

1895. *Deltocephalus unicoloratus*. Gillette and Baker. Colo. Expt. Sta. Bul. 31:89.

Unicolorous pale yellow, sometimes greenish-tinted; crown slightly longer than width between eyes, the apex bluntly rounded. Posterior margin of sternite VII slightly produced on median third. Plate narrowed at apex to an attenuated tip, not as long as pygofer. Length: male and female, 3.5 mm.

Specimens examined: 11; Nisswa, Polk County, Traverse County, Fort Snelling, Warren, Crookston, Cook County, and Ramsey County; June to August.

Laevicephalus sylvestris (Osborn and Ball)

1897. *Deltocephalus sylvestris* Osborn and Ball. Iowa Acad. Sci. Proc. 4:213.

Greenish, yellow-tinged. Crown sharply pointed, usually with a pair of longitudinal dark stripes which continue onto pronotum.

Posterior margin of sternite VII with a black truncate process on median third. Plates narrowed to bluntly pointed tips which are slightly divergent. Length: 3.5 mm.

Described from Iowa, and it should be collected in Minnesota, although not yet recorded.

Laevicephalus acus (Sanders and DeLong)

1920. *Deltocephalus acus* Sanders and DeLong. Pa. Dept. Agr. Tech. Bul. 1:10.

Yellow, the crown angularly pointed. Posterior margin of sternite VII produced on median half to a sharp broad tooth, margined with brown. Plate concavely narrowed to tip which is slightly exceeded by the narrowed pygofer. Length: male and female, 4 mm.

Specimens examined: 19; Lake, Cook, Todd, Polk, Kanabec, Ramsey, and Yellow Medicine counties; July to September.

Laevicephalus abdominalis (Fabricius)

1803. *Cercopis abdominalis* Fabricius. Syst. Rhyng., p. 98.

Relatively robust, green or greenish yellow, sometimes with black markings on the face. Posterior margin of sternite VII concavely, irregularly rounded between prominent lateral lobes, with a blunt median tooth, often three-pointed. Plates incised at about two thirds their length, then rounded to broad, blunt, slightly divergent tips. Length: male, 4.5 mm., female, 4.5-4.75 mm.

Specimens examined: 4; Cook County; August 28, 1938.

Laevicephalus uhleri Oman

1931. *Laevicephalus uhleri* Oman. Wash. Acad. Sci. Jour. 21:432.

Relatively large and robust, variably green or yellow, often marked with black. Fore wing entirely green, or blue black with green costal margin. Posterior margin of sternite VII produced, blackened, with a pair of slightly divergent teeth on each side of a median incision. Plate broad, convexly rounded to the somewhat truncate tip. Length: male, 4 mm., female, 4.25 mm.

Specimens examined: 12; Itasca Park, Twin Lake, Princeton, Cramer, and Kittson, Cook, and Ramsey counties; June to August.

Laevicephalus collinus (Boheman)

1850. *Deltocephalus collinus* Boheman. Svenska Vetensk. Akad. Handl. 1849:261.

Pale green, tinged with yellow. Crown with three pale longitudinal stripes, one on the middle, the others across the ocelli.

Posterior margin of sternite VII with a broad, short blunt tooth between sinuately rounded, blackened, lateral lobes. Plate broad at base, curved to bluntly rounded apex. Length: female, 4 mm.

Specimens examined: 1; Eagle Bend; July 5, 1922.

Laevicephalus plagus (Ball and DeLong)

1926. *Deltocephalus plagus* Ball and DeLong. N. Y. Ent. Soc. Jour. 34:241.

Crown bluntly angled, buff-colored, with a pair of brown stripes extending from apex, across pronotum, onto scutellum; additional stripes to each side on pronotum. Sternite VII with a sinuate posterior margin and with a slightly produced median lobe, the ovipositor exceeded in length by pygofer. Length: 3.5 mm.

Described from Wisconsin and it may be found in Minnesota, but not yet recorded.

Laevicephalus shingwauki Beamer and Tuthill

1934. *Laevicephalus shingwauki* Beamer and Tuthill. Kans. Ent. Soc. Jour. 7:19.

1935. *Laevicephalus shingwauki* DeLong. Ent. Soc. Amer. Ann. 28:157.

Stramineous; a pair of broad dark vittae extending from crown across pronotum to anterior portion of scutellum. Fore wing slightly smoky, shorter than abdomen. Two dorsal black spots on tip of abdomen of male, less conspicuous in female. Plate twice as long as valve, slightly convergent to the truncate tip, exceeded half its length by the pygofer. Sternite VII with posterior margin rounded to a median, broad tooth. Length: 2.5-3 mm.

According to Beamer and Tuthill (1934) the holotype male and a paratype male, Aitkin, August 25, 1933, are in the Snow Entomological collection, University of Kansas.

Laevicephalus incisurus (DeLong)

1926. *Deltocephalus concinnus* var. *incisurus* DeLong. Ohio State Univ. Studies 2:77.

1938. *Laevicephalus incisurus* Beamer. Canad. Ent. 70:225.

Crown bluntly angled, yellow brown. Nervures of fore wing pale, heavily margined with fuscous. Sternite VII with posterior margin sinuately excavated to a shallow median notch which is blackened on each side. Lateral angles produced, each with a small notch just within. Length: female, 3.75 mm.

Specimens examined: 1 female, Kawishiwi River, August 30, 1919, is doubtfully placed here.

Laevicephalus flavo-virens (Gillette and Baker)

1895. *Deltocephalus flavo-virens* Gillette and Baker. Colo. Expt. Sta. Bul. 31:87.

Greenish yellow, narrow, and elongate. Posterior margin of sternite VII produced medially into a blackened straplike process with two acute points. Plate broad at base, triangularly narrowed to a bluntly subacute tip, slightly exceeded by pygofer. Length: male, 4.25 mm., female, 4.5-4.75 mm.

Specimens examined: 25; Cook, Polk, Lake, Ramsey, and Kanabec counties; June, July, and August.

Laevicephalus affinis (Gillette and Baker)

(Pl. IV, Fig. 8, 8A; Pl. VI, Fig. 2)

1895. *Deltocephalus affinis* Gillette and Baker. Colo. Expt. Sta. Bul. 31:84.

Greenish, fuscous-marked, but variable in color and sometimes without fuscous markings on crown and pronotum. Sternite VII with posterior margin straight, except for a shallow median concavity. Plate only slightly exceeding the large rounded valve, the apex truncate, sloping inwardly. Length: male, 3.5 mm., female, 4 mm.

A very common species on bluegrass in Minnesota.

Specimens examined: 174; throughout state; May to October.

AMPLICEPHALUS DeLong

1926. Ohio State Univ. Studies 2:20, 83.

GENOTYPE: *Deltocephalus osborni* Van Duzee, 1892. Original designation.

Closely related to *Euscelis*, but with the middle anteapical cell constricted and divided. Broad and robust in form; crown much broader than long, very obtusely angled, in profile bluntly angled with the front (Pl. IV, Fig. 4).

DeLong and Caldwell (1937c) listed the species now included in this group.

Amplicephalus osborni (Van Duzee)

(Pl. IV, Fig. 4)

1892. *Deltocephalus Osborni* Van Duzee. Amer. Ent. Soc. Trans. 19:304.

Pale straw or tawny yellow, relatively robust in form. Crown with four dark spots on anterior margin, the median pair larger, the markings often confluent or indistinct. The pronotum usually has traces of five pale longitudinal lines. Length: male, 5-5.25 mm., female, 5.75-6 mm.

Specimens examined: 107; Ramsey County; August.

DELTOCEPHALUS Burmeister

1838. Genera Insectorum 1:41.

GENOTYPE: *Cicada pulicaris* Fallén, 1806. Subsequent designation.

Relatively short leafhoppers, usually with black spots or bars on crown. Crown bluntly angled, produced before the eyes, in profile rounding to the front, the margin scarcely present (Pl. IV, Fig. 9). Central anteapical cell of fore wing elongate, constricted, and divided.

This genus was monographed by DeLong (1926a) and discussed by DeLong and Sleesman (1929). New species which have been added since are listed by DeLong and Caldwell (1937c).

Key to Species

1. Species less than 2.5 mm. **gnarus**
Species usually 3 mm. or more 2
2. Dark brown or black; a few small white spots on crown; fore wing with costal nervure broadly yellow **flavicosta**
Species otherwise 3
3. Length more than 4 mm.; immaculate, smoky colored **fumidus**
Species smaller; with dark markings on crown 4
4. Crown light yellow; with two large round spots near ocelli **punctatus**
Crown with more extensive markings 5
5. Slender in form; crown with four black spots posterior to margin and with other lineate marks behind **sonorus**
Species robust; crown with spots forming a median line between ocelli, sometimes interrupted medially, and with a small pair at the apex 6
6. Fore wing with four conspicuous brown patches; posterior margin of sternite VII slightly notched medially; plate but slightly narrowed until just before apex **nigriventer**
Fore wing otherwise; sternite VII not notched; plate tapered from base to sharp apex 7
7. Crown nearly parallel margined; spots behind margin coalesced in an irregular band **balli**
Crown angulately produced; spots near ocelli distinct; two smaller triangular spots at apex 8
8. Plate but little longer than valve; posterior margin of sternite VII with a median tooth in a shallow concavity **megalopus**
Plate much longer than valve; sternite VII convexly rounded exposing membrane at sides **caperatus**

Deltocephalus gnarus Ball1900. *Deltocephalus gnarus* Ball. Canad. Ent. 32:345.

A small, easily recognized species; predominantly black, except for milky-white fore wing. The crown sometimes with a light spot at apex and oblique dashes near ocelli. Pronotum with

a narrow whitish posterior margin, and small light spots along anterior margin. Length: male and female, 2.75 mm.

Specimens examined: 1; Ramsey County.

Deltocephalus nigriventer Sanders and DeLong

1917. *Deltocephalus nigriventer* Sanders and DeLong. Ent. Soc. Amer. Ann. 10:85.

Dull yellowish, distinctly marked with a pair of spots at apex of crown and a broad black transverse band between ocelli, interrupted at the middle. Fore wing smoky white, with conspicuous dark spots between cross veins and on inner anteapical cell. Length: male, 2.75 mm.

Specimens examined: 1; Lake County (Baptism Creek); August 9, 1922.

Deltocephalus flavicosta Stål

1862. *Deltocephalus Flavicosta* Stål. Rio. Janeiro Hemip. 2: 53.

Dark brown or black; easily recognized by the few small yellow spots on crown and the broadly yellow anterior half of the costal margin. Length: 3-3.5 mm.

Found in Iowa on bluegrass and it should be taken in Minnesota.

Deltocephalus punctatus (Osborn and Ball)

1898. *Athysanus punctatus* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:94.

Light brownish yellow, the crown with two large round black spots on anterior half just within the ocelli. Fore wing with a reddish iridescence. Length: macropterous form, 3.5 mm.; brachypterous form, 2.5-2.75 mm.

Described from Iowa, and although not yet recorded it may be found in Minnesota.

Deltocephalus sonorus Ball

1900. *Deltocephalus sonorus* Ball. Canad. Ent. 32:344.

Relatively slender, grayish yellow to olivaceous. Crown marked with four black spots on margin, the pair at the apex usually smaller than outer pair; additional lineate spots usually present along posterior margin of crown. Posterior margin of sternite VII slightly excavated, with a rounded median lobe, the lateral lobes rounded. Plate broad at base, triangularly narrowed to the acute tip. Length: male, 3 mm., female, 3.5 mm.

Specimens examined: 20; Ramsey County.

Deltocephalus balli Van Duzee

(Pl. IV, Fig. 9)

1916. *Deltocephalus balli* Van Duzee. Check List Hemip., p. 71.

Dull brownish yellow, usually with four spots along margin of crown, the inner pair often larger than outer pair; sometimes the spots forming a dim transverse band. Fore wing subhyaline, smoky yellowish brown. Length: female, 3.5-3.75 mm., male, 3.5 mm.

Specimens examined: 86; Ramsey County and Crookston; June and July.

Deltocephalus megalopus (Osborn and Ball)1898. *Lonatura* ? *megalopa* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:85.

Grayish olive. Crown dull yellow, with two black spots at apex, a black transverse band between eyes and ocelli, intercepted medially, widest at the margin. Fore wing grayish, the nervures distinct, narrowly margined with brown. Length: female, 3.5 mm. (macropterous).

Specimens examined: 1; Ramsey County.

Deltocephalus caperatus Ball1900. *Deltocephalus caperatus* Ball. Canad. Ent. 32:343.

A narrow oval species, the fore wing well rounded at apex. Crown pale yellow, with black triangular spots either side of apex, and a broken black transverse band between anterior margins of eyes. Pronotum and scutellum immaculate, olive. Length: female, 3.25 mm.

Specimens examined: 1; Ramsey County.

Deltocephalus fumidus Sanders and DeLong1917. *Deltocephalus fumidus* Sanders and DeLong. Ent. Soc. Amer. Ann. 10:86.

A relatively slender species, dull brown, without distinguishing markings. Fore wing pale brown, longer than abdomen, and with nervures almost concolorous. Length: male, 4.25 mm., female, 4.75 mm.

Specimens examined: 18; Breckenridge, Wilkin County, Crookston, and Ramsey County; July.

LONATURA Osborn and Ball

1898. Davenport Acad. Nat. Sci. Proc. 7:83.

GENOTYPE: *Lonatura catalina* Osborn and Ball, 1898. Monobasic.

Head conical, the crown slightly obtusely produced. Pronotum about as long as crown, nearly truncate posteriorly, the lateral margins curving behind the eyes. Species macropterous or brachypterous; fore wing long and narrow with a distinct appendix, the venation obscure, sometimes the branches of radius and media uniting to form only two anteapical cells (Pl. VII, Fig. 10). In brachypterous forms, the pronotum covers most of base of fore wing which reaches the second abdominal segment.

DeLong (1926b) discussed the species in this genus.

Lonatura catalina Osborn and Ball

1898. *Lonatura catalina* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:83.

Crown yellowish, the pronotum and fore wing olivaceous, sometimes with a metallic brown sheen. Species brachypterous or macropterous. This species can be recognized by its small size and its predominantly brachypterous wings. Length: macropterous, 2.75 mm.; brachypterous, male, 1.85 mm., female, 2.25 mm.

Swept from a recently mown meadow in Minnesota just east of Wahpeton, North Dakota, July 24, 1935 (P. W. Oman), in United States National Museum collection.

Lonatura rotunda Beamer

(Pl. VII, Fig. 10)

1939. *Lonatura rotunda* Beamer. Kans. Ent. Soc. Jour. 12: 26.

Crown obtusely produced, yellowish brown, with conspicuous fuscous spots, four on anterior margin, a dash from ocelli to near median line, then hooked posteriorly and enclosing a pair of spots near posterior margin. Pronotum with four broad fuscous stripes, and a pair of spots on anterior margin. Fore wing hyaline, the clavus with fuscous spots at apex and medially near suture, sometimes the veins margined with fuscous. Length: male, 4 mm., female, 4.25 mm.

Specimens examined: 6; all macropterous forms; Pine and Ramsey counties; July.

ATHYSANELLA Baker

1898. Psyche 8:185.

GENOTYPE: *Athysanella magdalena* Baker, 1898. Original designation.

Relatively small and robust species easily recognized by the brachypterous form (macropterous forms are found, however) and the abnormally long ovipositor. Head wider than pronotum,

the crown obtusely produced, slightly depressed before the margin which broadly rounds to front. Pronotum usually shorter than crown, and with transverse striations on posterior part. Males of some species bear a prominent spine at tip of hind tibia. Most of the Minnesota species are distinctly marked with a large black spot on margin of crown next to each eye and a smaller spot at apex.

Ball and Beamer (1940) revised this genus and figured genital structures of the species.

Key to Species

1. Male with a prominent tibial spur; posterior margin of sternite VII deeply excavated2
 Male without a tibial spur; posterior margin of sternite VII not deeply excavated (Subg. *Amphipyga*)3
2. Sternite VII with a median tooth on posterior margin; plate shorter than pygofer**robusta**
 Sternite VII without a median tooth, plate as long as pygofer **terebrans**
3. Female, 5 mm., male, 3.25 mm.; sternite VII considerably longer than preceding segment; plate about one third shorter than pygofer which is narrowed to a ventrally directed beak at apex.....**attenuata**
 Smaller species; sternite VII not greatly longer than preceding segment; male not as above4
4. Usually macropterous; posterior margin of sternite VII with a median lobe extending beyond lateral lobes; plates contiguous at base and as long as pygofer.....**occidentalis**
 Usually brachypterous; fore wing heavily lined with fuscous; sternite VII without a median lobe; plates usually short and widely separated at base.....5
5. Posterior margin of sternite VII almost truncate; plate broadly triangular**acuticauda**
 Sternite VII almost smoothly convex, plate with a truncate apex and the pygofer almost rectangular.....**balli**

Athysanella terebrans (Gillette and Baker)

1895. *Eutettix terebrans* Gillette and Baker. Colo. Expt. Sta. Bul. 31:102.

Tawny yellow; the large spots next each eye connected on posterior edge by a dull white narrow transverse band. Fore wing covering second abdominal segment, the veins whitish, darker between. Dorsal surface of abdomen with a pronounced yellow-white median longitudinal line, each segment with a transverse row of small black dots. Posterior margin of sternite VII deeply excavated, the base of notch wide, almost truncate, and edged with black. Plates long and broad, divergent, with posterior margins truncate. Tibial spur slender, about half as long as first tarsal segment. Length: female, 4.75 mm.

Specimens examined: 1; Browns Valley; August 4, 1935.

Athysanella robusta Baker

1898. *Athysanella robusta* Baker. Psyche 8:187.

Grayish yellow, with indistinct markings, except for the usual spots on crown. Sternite VII deeply excavated, with a median tooth about half the length of the acute lateral angles. Hind tibia of male with a spur at apex; sometimes absent. Plates divergent, short, and triangular with posterior margins rounded, the pygofer long and ribbonlike. Length: male, 3 mm., female, 4 mm.

Not represented in Minnesota collection, but reported in Iowa and it may be found here.

Athysanella (Amphipyga) acuticauda Baker

1898. *Athysanella acuticauda* Baker. Psyche 8:187.

A darkly colored species; anterior margin of pronotum with a row of small black spots; fore wing heavily lined with fuscous between the veins. Dorsal surface of abdomen with a pair of irregular longitudinal lines at each side and on the middle. Sternite VII truncate behind, black except along lateral edge; ovipositor but little extended beyond pygofer. Plate short and triangular, about half the length of pygofer. Length: female, 3.5-4 mm.

This species may be found on bluegrass by sweeping very close to the ground.

Specimens examined: 5; all brachypterous females; Ramsey County, Crookston, Hennepin County, and Lancaster; June and July.

Athysanella (Amphipyga) attenuata Baker

1898. *Athysanella attenuata* Baker. Psyche 8:188.

The spots on the crown are sometimes obscure or absent. Anterior portion of pronotum usually with three pairs of black dots. Males darker and more heavily marked. Sternite VII longer than preceding segment, the posterior margin slightly produced and darkly colored on the middle. Length: male, 3.25 mm., female, 5 mm.

Specimens examined: 6; 1 macropterous and 5 brachypterous; Lancaster, Browns Valley, Kittson County, and Ramsey County; June to August.

Athysanella (Amphipyga) balli Osborn

1928. *Amphipyga balli* Osborn. Ohio Biol. Survey Bul. 14: 289.

Black spots on margin of crown; fore wing with a dark oblique vittae. Male pygofer almost rectangular; plates together broader

at base than the valve, triangular, and divergent. Sternite VII with posterior margin slightly rounded, bearing a shallow median tooth, and the lateral margin with a short rounded process.

Reported in Iowa and it may be collected in Minnesota.

Athysanella (Amphipyga) occidentalis Baker

1898. *Athysanella occidentalis* Baker. *Psyche* 8:186.

Head and pronotum heavily overlaid with brown, the posterior margin of pronotum very dark. Fore wing slightly longer than ovipositor. Veins margined with fuscous, the appendix distinct. Sternite VII with posterior margin roundly produced at the middle and darkened with fuscous. Length: female, 3.5 mm.

Specimens examined: 2; macropterous; Traverse and Ramsey counties.

DORATURA Sahlberg

1871. *Cicadariae* Finlands, p. 291.

GENOTYPE: *Athysanus stylatus* Boheman, 1849. Subsequent designation.

Resembling *Athysanella* in the long ovipositor, and the rounded crown which is shorter medially than the width between the eyes. Differing in that the anterior margin of crown is rather sharp in profile, slightly overhanging the face, and with a slight depression just behind on the disc of the crown.

Ball and Beamer (1940) discussed the single American species in this genus which has been introduced from Europe.

Doratura stylata (Boheman)

1849. *Athysanus stylatus* Boheman. *Svenska Vetensk. Akad. Handl.* 1847:31.

Grayish yellow, conspicuously marked with three black spots on anterior margin of crown, the median one larger, and a pair of black dashes near posterior margin. Face with two black cross stripes, one underneath margin of crown and a heavier one below which extends across pronotum. Occurs in macropterous or brachypterous forms. Length: female, 4 mm., male, 3.5 mm.

The writer has examined specimens from Wisconsin, on potato, and it may be found in Minnesota.

DRIOTURA Osborn and Ball

1898. *Davenport Acad. Nat. Sci. Proc.* 7:87.

GENOTYPE: *Athysanus gammaroides* Van Duzee, 1894. Subsequent designation.

Short and broad, usually brachypterous, rarely macropterous.

Crown short, over twice wider than long, scarcely produced anteriorly; in lateral view rounded to a broad and short face. Pronotum slightly longer than crown, transversely striated, the lateral margin continuing around and below the eye without a lateral carina. Fore wing coriaceous, rugose, extending to base of abdomen in brachypterous forms, to tip of ovipositor in macropterous forms. Female pygofer long, exceeded by the ovipositor.

Lawson (1928) discussed this group.

Driotura robusta Osborn and Ball

1898. *Driotura robusta* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:87.

Crown yellowish white, irregularly marked with black; face with dark arcs. Pronotum whitish, irregularly black on anterior half. Fore wing reaching second abdominal segment, with numerous white reticulations, the interspaces dark. Abdomen white above, maculate with black. Length: female, 3.5 mm.

Specimens examined: 1; Olmsted County.

Driotura gammaroides (Van Duzee)

1894. *Athysanus gammaroides* Van Duzee. Buffalo Soc. Nat. Sci. Bul. 5:209.

Entirely glossy black, except reddish tip of ovipositor and sometimes two small reddish-brown spots near margin of crown. Fore wing strongly rugose in the brachypterous form, coriaceous in the macropterous. Several color varieties are known, one of which is recorded below. Length: 3-4 mm.

Specimens examined: 12; Plummer, Fort Snelling, Traverse County, Itasca Park, and Big Stone County; May to July. All brachypterous except one macropterous female from Traverse County.

Driotura gammaroides var. *fulva* Ball

1903. *Driotura gammaroidea* [sic] var. *fulva* Ball. Canad. Ent. 35:231.

Similar in form to *gammaroides*, but uniformly brown in color.

Specimens examined: 1, brachypterous; Fort Snelling; June 28, 1923.

REMADOSUS Ball

1929. Amer. Ent. Soc. Trans. 55:2-3.

GENOTYPE: *Athysanus magnus* Osborn and Ball, 1897. Original designation.

Large species, crown short and parallel margined, rounded to

the broad front. Ocelli distant from eyes, in a broad depression under the margin between crown and front. Fore wing long, only slightly narrowed at apex; without the second cross vein.

Sleesman (1929) discussed members of this genus.

Remadosus magnus (Osborn and Ball)

1897. *Athysanus magnus* Osborn and Ball. Iowa Acad. Sci. Proc. 4:225.

Straw-colored; crown, pronotum, and scutellum uniformly irrorate with fuscous, except for an ivory-white band on pronotum. Fore wing brown, except for a white costal stripe, the nervures fuscous, margined with straw. Length: female, 8.5 mm.

Specimens examined: 1; Ramsey County.

ATHYSANUS Burmeister

1838. Genera Insectorum 1:40.

GENOTYPE: *Cicada argentata* Fabricius, 1794. Subsequent designation.

Broad and short species, the crown much wider than long, only slightly produced, in lateral view rounded to the inflated, almost square front, without a definite margin. Fore wing without the second cross nervure, almost parallel margined.

Athysanus frigidus Ball

1899. *Athysanus frigidus* Ball. Ent. News 10:172.

Grayish white, with four shining black spots on anterior margin of crown, usually with black spots on front beneath those on crown. Pronotum straw-colored, irregularly marked with four small spots near anterior margin. Length: 4-4.5 mm.

Swept from *Artemisia frigida* near Battle Lake, July 24, 1935 (P. W. Oman); in United States National Museum collection.

EXITIANUS Ball

1929. Amer. Ent. Soc. Trans. 55:2, 5.

GENOTYPE: *Jassus* (*Thamnotettix*) *obscurinervis* Stål, 1858. Original designation.

Crown obtusely angular, in lateral view convex and broadly rounded to the wedge-shaped front (Pl. V, Fig. 1, 1A). Fore wing hyaline, sometimes smoky, without the second cross vein, with an unusually enlarged appendix (Pl. VI, Fig. 6). Ovipositor long and greatly extended beyond the slender pygofer.

Ball (1936d) reviewed the North American species in this genus.

Exitianus obscurinervis (Stål)

(Pl. V, Fig. 1, 1A; Pl. VI, Fig. 6)

1858. *Jassus* (*Thamnotettix*) *obscurinervis* Stål. Svenska Fregattens Eugenies; Resa Hemip., p. 293.

Color variable, usually light gray, sometimes darker. Crown with a pair of round black spots on margin between the red ocelli, often one at apex, and with oblique dashes and crescents behind. Pronotum dotted with a row of four irregular black spots on anterior margin. Fore wing hyaline, exceeding abdomen in length, nervures dark brown. Length: male, 3.5-4 mm., female, 5-5.5 mm.

A common species on bluegrass.

Specimens examined: 11,475; all parts of the state; May to September.

LIMOTETRIX Sahlberg1871. *Cicadariae* Finlands, p. 224.

GENOTYPE: *Cicada striola* Fallén, 1806. Subsequent designation.

Head broad; fore wing long and narrow giving the species a distinct wedge-shaped appearance. Crown short, variably produced but not especially angled, in lateral view slightly convex and broadly rounded to the front (Pl. V, Fig. 3). Fore wing without the second cross vein, the apical cells narrow and elongated. Easily recognized by heavy black transverse band on crown.

Sleesman (1929) reviewed this genus and figured the genitalia; Lawson (1931a) added new species and presented a key to the species (as *Drylix*).

Key to Species

1. Crown definitely produced; plates together triangular; posterior margin of sternite VII excavated, without prominent lateral lobes.....2
- Crown nearly parallel margined, not definitely produced; plates together usually not triangular; sternite VII may be notched but with prominent lateral lobes (except *nigrax*).....3
2. Species long and slender, 5 mm. or longer; plate very long; sternite VII deeply excavated *utahnus*
- Species small, wedge-shaped, 5 mm. in length; plate not extremely long; sternite VII shallowly excavated..... *striolus*
3. Species large and robust, usually yellow; plate rounded apically, sternite VII with a U-shaped notch rounded to the lateral lobes *parallelus*
- Species smaller, usually dark; genitalia otherwise.....4
4. Plate short, apex blunt with a slight hook on the inner margin; sternite VII nearly truncate, with a deep black-bordered median notch *uneolus*
- Plate otherwise; sternite VII not deeply notched.....5
5. Plate truncate; sternite VII with a slight median notch sharply toothed at each side..... *truncatus*
- Plate triangular; sternite VII shallowly excavated..... *nigrax*

Limotettix striolus (Fallén)

(Pl. V, Fig. 3)

1806. *Cicada striola* Fallén. Svenska Vetensk. Akad. Handl. 27:31.

Greenish yellow, immaculate, except for a slightly bowed transverse black band on crown. Sternite VII with posterior margin strongly excavated. Plates long and together triangular. Length: male, 3.5-4 mm., female, 4.5-5 mm.

Specimens examined: 589; Polk, Ramsey, Todd, Hennepin, and Cook counties; June, July, and August.

Limotettix parallelus (Van Duzee)1891. *Athysanus parallelus* Van Duzee. Canad. Ent. 23:169.

Pale yellowish, the crown parallel margined and with a broad black band. Sternite VII with a V-shaped notch extending half its length, the posterior sides of notch rounded to the lateral margins. Plate about twice the length of the valve, rounded to the blunt apex. Length: male, 5-5.5 mm., female, 5.5-6 mm.

Specimens examined: 40; Grand Marais, Lake Itasca, Mora, Wilkin County, and Ramsey County; July and August.

Limotettix truncatus (Sleesman)1929. *Drylix truncatus* Sleesman. Ent. Amer. 10:100.

Crown dark, almost parallel margined, with a broad black band; pronotum black on posterior half; fore wing dark, the nervures pale green. Plate about length of valve, only slightly narrowed to the truncate apex. Posterior margin of sternite VII truncate. Length: male, 5 mm., female, 5.25 mm.

Specimens examined: 24; Ramsey County.

Limotettix uneolus (Ball)1929. *Drylix uneolus* Ball. Amer. Ent. Soc. Trans. 55:6.

Greenish yellow, with a transverse black band on crown just back of the ocelli. Sternite VII with a deep semicircular median notch, margined with black. Plates broad at base, slightly narrowed apically, caliperlike on inner margins. Length: 4.5-5 mm.

Not recorded from Minnesota but collected in North Dakota and may be found in this state.

Limotettix utahnnus (Lawson)1931. *Drylix utahnnus* Lawson. Ent. Soc. Amer. Ann. 24:590.

Brownish yellow, elongate. Fore wing yellow, often definitely smoky. Plate narrow, triangular, greatly exceeding pygofer in

length. Sternite VII broadly excavated about half its length. Length: male, 5-5.5 mm., female, 6 mm.

Specimens examined: 12; Wilkin County, Crookston, Grand Marais, and Ramsey County; July and August.

Limotettix nigrax n. sp.

(Pl. IX, Fig. 2)

Similar to *L. truncatus* (Slees.) in the dark color and notched posterior margin of sternite VII in female, but with notch deeper and wider. Similar to *L. striolus* (Fall.) in the blunt-tipped apex of plate, but with the genitalia different. Distinguished from other members of the genus by its very black color. Length: male, 5 mm., female, 5.75 mm.

Head broad, wider than pronotum. Crown parallel margined, the anterior margin broadly rounded and in profile evenly curved to the face. Fore wing long and narrowly wedge-shaped, extending over 1 mm. beyond tip of the abdomen.

Male: General body color lemon yellow, heavily overlaid with black. Crown with a black bar at apex, another extending from eye to eye just behind the reddish ocelli, the black narrowly bordering the eyes, except at posterior margin. Face black, except for the yellow arcs, the black being concentrated along the sutures. Pronotum black in a thin line along anterior margin, heavily mottled with black, except for anterior fourth. Scutellum with lateral angles and apex black, except for the yellow margin, the black extending entirely across the anterior margin of scutellum leaving a small yellow rectangle in front of the transverse suture. Underparts black, the lateral margins of abdomen and posterior margins of the sternites narrowly yellow. Valve and plates entirely black. Fore wing subhyaline, black except for the yellow veins on basal two thirds. The coloration of the veins becomes abruptly concolorous with the black wing in apical third of the wing.

Female: Marked with black as in the male, but not as extensively. Fore wing without the heavy darkening as in male, except at costal margin; veins more broadly yellow. Apex of wing smoky, the veins also dark. Ovipositor black, the yellow pygofer marked with black along the ovipositor. Posterior margin of sternite VII widely black.

Variation: The black coloration in either sex may be more or less extensive than described above. In some males the yellow may be much obscured or entirely lacking, except for narrow margins or spots. In some females the black markings may be as

in the males, or may be so much lighter that the entire fore wing is sordid yellow.

Genitalia: Female with sternite VII longer than the preceding segment, the posterior margin deeply cut by a wide V-shaped notch. Male valve almost as long as preceding segment; plate over twice as long as valve and roundly tapered to a blunt tip. Plates separated apically, with numerous bristles along lateral margins. Aedeagus in lateral view with a bulbous process articulated to a rodlike base, the process hollow, with a dorsal opening flanked by two small spines, and directly below the spines a notch with a small leaflike attachment. Pygofer with a spine arising from the dorsoposterior margin and curving downward past the ventral margin.

Type: male, St. Paul, Minnesota, July 31, 1939, Midland Hills Golf Course light 2.

Allotype: female, St. Paul, Minnesota, July 31, 1939, Midland Hills Golf Course light 5.

Paratypes: 17; St. Paul, Minneapolis, Lake Itasca, and Pelican Rapids.

All types deposited in the University of Minnesota collection.

EUSCELIS Brullé

1832. Exped. Sci. Morée 3:109.

GENOTYPE: *Euscelis lineolata* Brullé, 1832. Monobasic.

Dull-colored, obscurely marked species, the crown short, bluntly angulate, in lateral view obtusely rounded to the front to form a bluntly pointed cone (Pl. V, Fig. 5). Fore wing variable, sometimes distinctly shorter than abdomen, the apical cells short and broad, the second cross nervures often present.

Sleesman (1929) reviewed this group and figured the male genitalia.

Key to Species

Lower angles of male pygofer extended, much longer than plates; posterior margin of sternite VII truncate on middle half **extrusus**
 Plate with attenuated apex, no extrusion of the pygofer; sternite VII roundly excavated and bearing a small black triangular tooth in the middle **sahlbergi**

Euscelis extrusus (Van Duzee)

(Pl. V, Fig. 5)

1893. *Athysanus extrusus* Van Duzee. Canad. Ent. 25:283.

Dark straw-colored, usually with four triangular brown spots on crown. Easily recognized by the distinctive genitalia of either sex. Slender tip of male pygofer extending much beyond the

broad plate. Posterior margin of sternite VII truncate on middle half, the lateral margins acutely produced and clasped around the pygofer. Length: male, 4.5-5 mm., female, 5-5.25 mm.

Specimens examined: 26; Marshall, Norman, Clearwater, Cass, Anoka, Ramsey, Hennepin, and Houston counties; May, June, and early July. This species occurs in brachypterous and macrop-terous forms.

Euscelis sahlbergi (Reuter)

1880. *Athysanus Sahlbergi* Reuter. Med. Soc. Faunae et Flora Fennica 5:209, 219-220.

1917. *Euscelis deceptus* Sanders and DeLong. Ent. Soc. Amer. Ann. 10:87.

Brownish straw in color; markings often indistinct, sometimes with a pair of dark spots on disc of crown, and a row of light spots on pronotum. Fore wing yellowish brown, venation indistinct. The ocelli are blood red. Length: male, 5-5.25 mm., female, 5.5-6 mm.

Specimens examined: 642; Breckenridge, Crookston, St. Anthony Park, Wilkin County, Owatonna, and Ramsey County; June and July.

OPHIOLA Edwards

1922. Ent. Monthly Mag. 58:206-207.

GENOTYPE: *Cicada striatula* Fallén, 1826. Subsequent designation.

Usually dull brown or fulvous species, relatively small and elongate; crown acutely, roundly produced and more or less marked by transverse, irregular black lines (Pl. V, Fig. 2). Fore wing usually longer than abdomen, the central anteapical cell somewhat constricted at the middle, the nervures light-colored and outlined by fuscous.

Ball (1928) reviewed this genus and Sleesman (1929) figured the male genitalia. Reliable identifications of a few species in the genus seems possible only by the study of the internal male genitalia.

Key to Species

1. Fore wing only slightly exceeding abdomen, nearly truncate apically, the apical cells broad and relatively short..... **uhleri**
Fore wing definitely longer than body, sometimes flaring, the central anteapical cell usually elongated..... 2
2. First cross nervure broadly outlined in yellow or white..... **vara**
Fore wing concolorous, the first cross nervure not distinctly outlined 3
3. Fore wing black..... **cornicula**
Fore wing not markedly black..... 4

4. Crown only slightly rounded, species yellowish..... *angustata*
Crown distinctly angled, species variously colored but usually dark.... 5
5. Tibiae and apex of femora orange, remainder of femora shining
black *osborni*
Legs not as above..... 6
6. Species tawny red..... *symphoricarpae*
Species olivaceous brown..... 7
7. Short and stout; fore wing only slightly exceeding abdomen; tawny
crown heavily inscribed with fuscous..... *arctostaphyli*
Long and narrow in form, the fore wing flaring, olive in color; middle
femora twice banded with white..... *striatula*

Ophiola uhleri (Ball)

1911. *Athysanus Uhleri* Ball. Canad. Ent. 43:200.

A broad, dark species, usually showing yellow beneath. Sometimes the crown with a yellowish transverse band, and spots next to the eye, and irrorations over pronotum. Fore wing usually dark, the truncate apex giving this species a distinctive appearance. Length: male, 4 mm., female, 4.5 mm.

Specimens examined: 14; Ramsey, Norman, Cook, Lake, and Hubbard counties; June, July, and August.

Ophiola arctostaphyli (Ball)

1899. *Athysanus arctostaphyli* Ball. Ent. News 10:172.

Much like *striatula*, but shorter, broader, and more deeply olive brown. Crown tawny, transversely marked with black. Fore wing brown, the nervures testaceous and margined with fuscous. Length: male, 4 mm., female, 4.25 mm.

Specimens examined: 7; Willow River, Ramsey County; August.

Ophiola cornicula (Marshall)

1866. *Jassus corniculus* Marshall. Ent. Monthly Mag. 3:119.

Heavily darkened with fuscous. Crown yellowish, heavily lined with black as are the pronotum and scutellum. Fore wing long and narrow, smoky subhyaline, with the pale nervures heavily margined with fuscous. Length: male, 3.75-4 mm., female, 4.25-4.5 mm.

Specimens examined: 47; Ramsey County and Baudette; August.

Ophiola angustata (Osborn)

1915. *Athysanus angustatus* Osborn. Maine Agr. Expt. Sta. Bul. 238:130.

Elongate, greenish yellow, resembling a *Limotettix*. Crown with fuscous bands; pronotum and scutellum irregularly marked with black. Length: male, 4.75 mm., female, 5 mm.

Specimens examined: 6; Grand Marais, Lake County (Baptism Creek), and Ramsey County; August.

Ophiola symphoricarpae (Ball)

1901. *Athysanus symphoricarpae* Ball. Canad. Ent. 33:5.

Light brownish red; crown pale testaceous, with reddish transverse lines; fore wing reddish, nervures paler, and slightly margined with fuscous. Length: male, 4 mm., female, 4.5-5 mm.

Specimens examined: 6; Ramsey County and Willow River; August.

Ophiola vara (Ball)

1901. *Athysanus varus* Ball. Canad. Ent. 33:5.

Straw-colored, but usually darkened with fuscous. Fore wing with light yellow nervures, the cells irregularly and heavily clouded with fuscous. Recognized by the broadly yellow to white first cross nervure. Length: male, 4.5 mm., female, 5 mm.

Specimens examined: 331; Ramsey County and Rochester; July.

Ophiola striatula (Fallén)

(Pl. V, Fig. 2)

1806. *Cicada striatula* Fallén. Svenska Vetensk. Akad. Handl. 27:31.

Dark yellowish olive, with fuscous transverse bands on crown. Fore wing light, but the cells filled with fuscous. Front dark, the face arcuately marked with olive; venter brownish yellow. Length: male, 4 mm., female, 4.25-4.5 mm.

A species common in cranberry bogs and definitely associated with that host. Economically important as a vector of a cranberry virus disease. However, there is some doubt if our species is *striatula*, and if the American form is different from the European species it will be known as *vaccinii* (Van Duzee).

Specimens examined: 14; Willow River, Kawishiwi River, Cook County (Beaver Dam), and Ramsey County; August.

Ophiola osborni Ball

1928. *Ophiola osborni* Ball. Brooklyn Ent. Soc. Bul. 23:190.

Olive brown, but with a definite orange cast. Fore wing testaceous, nervures pale, and heavily bordered with fuscous. Front and venter dark, the fore and middle femora black to just before the apices, then orange. The continuation of orange on the tibiae gives this species a distinctive appearance. Length: male, 3.75 mm., female, 4.5 mm.

Specimens examined: 11; Traverse County, Kandiyohi County, Minneapolis, Norman County, Fort Snelling, Lancaster, and Ramsey County; June and July.

COMMELLUS Osborn and Ball

1902. Ohio Nat. 2:232, 245.

GENOTYPE: *Athysanus comma* Van Duzee, 1892. Original designation.

Broad, stout species, the head as wide as pronotum; crown angularly produced, in profile flat and angled with front with a definite margin (Pl. V, Fig. 4). Fore wing of two forms; shorter than abdomen and slightly flaring, or distinctly longer and parallel margined. Venation irregular, sometimes obscured by longitudinal stripes, the second cross nervure sometimes present. Posterior margin of sternite VII deeply excavated, the apex of plate broad, almost truncate.

Sleesman (1929) and Thomas (1933) reviewed the species of this genus.

Key to Species

1. Two spots on margin between crown and front.....**sexvittatus**
Four spots on margin between crown and front.....2
2. Four stripes on each fore wing; anteapical cells lacking or very small**comma**
Eight stripes on each fore wing; one large anteapical cell.....**colon**

Commellus comma (Van Duzee)

(Pl. V, Fig. 4)

1892. *Athysanus comma* Van Duzee. Canad. Ent. 24:114.

A creamy-white species easily recognized by its characteristic markings. Four black spots on anterior margin of crown, a pair of small spots near the posterior margin, and four black longitudinal stripes on pronotum, which continue onto fore wing as rusty brown stripes. Length: male, 4 mm., female, 4.25 mm.

Reported on *Elymus canadensis* by Osborn and Ball (1897) and the writer has collected it from quack grass.

Specimens examined: 12; St. Paul, Hennepin County, Kittson County, and Le Sueur County; June and July.

Commellus colon (Osborn and Ball)

1897. *Athysanus colon* Osborn and Ball. Iowa Acad. Sci. Proc. 4:223.

Separated from *comma* by the eight instead of four fulvous brown stripes of each fore wing. Length: female, 5 mm.

Specimens examined: 1; Traverse County.

Commellus sexvittatus (Van Duzee)

1894. *Athysanus sexvittatus* Van Duzee. Canad. Ent. 26:93.

Grayish yellow. Three pairs of spots on crown, the apical pair shining black and extending over margin to front, the two posterior pairs on disc being much lighter in color. Six irregular brownish longitudinal stripes on the pronotum. The females may be brachypterous or macropterous; the males are brachypterous. Length: male, 3.5-4 mm., female, 4-4.5 mm.

Specimens examined: 7, Lancaster, Otter Tail County, and Polk County; June and July.

AMBLYSELLUS Slesman

1929. Ent. Amer. 10:93, 131.

GENOTYPE: *Amblycephalus curtisii* Fitch, 1851. Original designation.

Short and broad species, the crown obtusely pointed, almost right-angled, slightly wider between eyes than length at middle (Pl. V, Fig. 6). Front broad at apex, narrowed triangularly to the nearly parallel-sided, long clypellus. Fore wing with anteapical cells parallel margined, without the second cross vein.

Amblysellus curtisii (Fitch)

(Pl. V, Fig. 6)

1851. *Amblycephalus curtisii* Fitch. Homop. N. Y. State Cab., p. 61. (Also: 1893. N. Y. State Ent. Rpt. 9:401.)

Yellowish green with two large round black spots on the crown; a wide black band on anterior margin of the pronotum. Fore wing brownish black; the nervures (except of apical cells) and margins greenish yellow. Length: male, 3 mm., female, 3.25-3.5 mm.

The writer found this species very abundant in Washington County, July, 1940, in marshy places along streams.

Specimens examined: 29; Rice, Houston, Olmsted, Chisago, Hennepin, and Ramsey counties; June, July, and August.

STIRELLUS Osborn and Ball

1902. Ohio Nat. 2:232, 250.

GENOTYPE: *Athysanus bicolor* Van Duzee, 1892. Original designation.

Crown narrow and subconically produced, the median length slightly greater than the width between the eyes, in profile convex and rounded to the front without a distinct margin. Relatively small species with ovipositor exceeding pygofer. Fore wing broad and short in form, simple venation and small appendix.

This genus is not yet represented in the Minnesota collection, but the genotype, *Stirellus bicolor* (Van Duzee), is a common meadow species and has been reported in Iowa.

ALIGIA Ball

1907. Davenport Acad. Sci. Proc. 12:31, 53.

GENOTYPE: *Jassus jucundus* Uhler, 1877. Original designation.

Crown short, rounded to front without an angled margin, except near apex, and with a faint transverse depression (Pl. V, Fig. 11, 11A). Fore wing subhyaline, nervures distinct. The presence of the second cross nervure and supernumerary veinlets along the costa and claval suture distinguish the members of this genus from *Eutettix* (Pl. VII, Fig. 8).

This genus has not yet been recorded in Minnesota, although *modesta* (Osborn and Ball) is reported from Iowa and should be found here on oak. Through the courtesy of Leon Hepner (1939) who revised this genus, two pairs of *Aligia meridiana* Hepner (paratypes) are in the Minnesota collection.

MESAMIA Ball

1907. Davenport Acad. Sci. Proc. 12:31, 59.

GENOTYPE: *Eutettix* (*Mesamia*) *nigridorsum* Ball, 1907. Original designation.

Crown parallel margined, in lateral view concave, the anterior margin elevated, slightly produced, and acutely angled with the narrow front (Pl. V, Fig. 12). Fore wing hyaline, or nearly so, with two cross nervures and darkened extra veinlets to costa and along clavus (Pl. VII, Fig. 11).

Key to Species

1. Without spots on anterior margin of crown.....*ludoviciana*
 With spots on anterior margin of crown.....2
2. Fore wing with a dark saddle between cross nervures.....*nigridorsum*
 Fore wing without a definite cross band.....*straminea*

Mesamia nigridorsum Ball

(Pl. V, Fig. 12; Pl. VII, Fig. 11)

1907. *Eutettix* (*Mesamia*) *nigridorsum* Ball. Davenport Acad. Sci. Proc. 12:60.

Crown with a narrow black line between ocelli, broadened into a quadrangular spot either side of apex, the anterior margin ivory, brown posterior to the spots. Fore wing milky white, with prominent nervures and a dark saddle across posterior two thirds of clavus, the costal veinlets black. Length: male, 4.25-4.5 mm., female, 5-5.25 mm.

Specimens examined: 30; Norman, Ramsey, Hennepin, Cass, Steele, Marshall, Morrison, Lake, Fillmore, Renville, Traverse, Kanabec, Houston, and Lincoln counties; June to September; and one male, St. Paul, taken on *Artemisia ludoviciana*, September 3, 1923.

Mesamia straminea (Osborn)

1898. *Paramesus stramineus* Osborn. Iowa Acad. Sci. Proc. 5:241.

Uniformly greenish straw, with dark veins but lacking a saddle on fore wing. Crown ivory on anterior margin, posteriorly bordered by an irregular black line sometimes broken into four spots. Fore wing milky white, fuscous apically, and with darkened costal nervures. Length: 4.5-5 mm.

Reported in Iowa on *Helianthus*.

Specimens examined: 1; Anoka County; September 13, 1933.

Mesamia ludoviciana Ball

1931. *Mesamia ludoviciana* Ball. Brooklyn Ent. Soc. Bul. 26:93.

Pale greenish white, without markings. Fore wing subhyaline, the nervures milky, except apically where they are smoky; disc with faint fuscous reticulations and costal nervures darkened. Length: male and female, 4.25 mm.

This species has been collected at Fridley sand dunes, Anoka County, during September, on *Artemisia*, and is strikingly protectively colored for this host.

Specimens examined: 2; Traverse and Ramsey Counties.

BANDARA Ball

1931. Brooklyn Ent. Soc. Bul. 26:93.

GENOTYPE: *Eutettix johnsoni* Van Duzee, 1894. Original designation.

Crown slightly produced, the transverse depression behind margin indistinct (Pl. V, Fig. 8). Fore wing with a distinct appendix, and with two closed antepical cells, the outer being short and broader posteriorly than at base. Tawny in color, the fore wing with numerous opalescent spots (Pl. VI, Fig. 4).

Ball (1931b) discussed this genus.

Bandara johnsoni (Van Duzee)

(Pl. V, Fig. 8; Pl. VI, Fig. 4)

1894. *Eutettix Johnsoni* Van Duzee. Canad. Ent. 26:137.

Crown with three pairs of black spots above a curved black line along anterior margin. Pronotum with three white longi-

tudinal lines. Fore wing orange fulvous, maculate with numerous oval milky-white spots. Length: male and female, 4.75 mm.

Specimens examined: 2; Ramsey County.

PLATYMETOPIUS Burmeister

1838. Genera Insectorum 1:42.

GENOTYPE: *Jassus rostratus* Herrich-Schaeffer, 1834. Subsequent designation.

Crown obtusely angled, nearly as long as pronotum. Front relatively broad, definitely margined as it meets the crown. Fore wing without second cross vein, with extra veinlets to costa at right angles, and with white areolar spots but no vermiculate markings (Pl. VI, Fig. 7).

Platymetopius vitellinus (Fitch)

(Pl. VI, Fig. 7)

1851. *Acocephalus vitellinus* Fitch. Homop. N. Y. State Cab., p. 57. (Also: 1893. N. Y. State Ent. Rpt. 9:397.)

Golden yellow; crown and pronotum immaculate, the fore wing with milky-white spots, and a reddish-brown band from apex of clavus obliquely forward to costa. Posterior margin of sternite VII with a median straplike tooth. Length: male, 6 mm., female, 7 mm.

Specimens examined: 11; Polk County, Crookston, Sacred Heart, Cook County (Lake Superior shore), Grand Marais (Devil's Track River), and Ramsey County; June to August.

EUTETTIX Van Duzee

1892. Psyche 6:307.

GENOTYPE: *Thamnotettix lurida* Van Duzee, 1890. Original designation.

Stout and heavy-bodied leafhopper, the head slightly wider than pronotum. Crown obtusely rounded, almost parallel margined, in profile slightly sloping, and with a distinct transverse furrow before apex which fades near the ocelli (Pl. V, Fig. 10, 10A). Fore wing slightly flaring at apex, without reticulations or supernumerary veinlets, the second cross vein lacking (Pl. VII, Fig. 12). Posterior margin of sternite VII with a slightly notched tooth, about as wide as long. Male plates together spoon-shaped, with hairs along margins. Usually each plate has a dark line on its disc, parallel with the outer margin and half its length.

Ball (1907) reviewed the genus *Eutettix* and later (Ball, 1931a) erected several genera to accommodate species of the group.

Key to Species

- | | |
|--|------------------|
| 1. 3 to 3.5 mm. in length..... | <i>tenellus</i> |
| 5 mm. or more in length..... | 2 |
| 2. Fore wing with a white commissural spot | <i>lurida</i> |
| Fore wing without a distinct spot..... | 3 |
| 3. Color mottled brown..... | <i>marmorata</i> |
| Color pale straw or golden yellow..... | <i>querci</i> |

Eutettix tenellus (Baker)

(Pl. V, Fig. 9; Pl. VI, Fig. 9)

1896. *Thamnotettix tenellus* Baker. Psyche 7 (Suppl.): 24.

A creamy to pale orange-colored species sometimes suffused with reddish. Fore wing greenish or milky subhyaline, occasionally blotched with fuscous. Posterior margin of sternite VII with a median semicircular notch about half the length of the sternite. Plates together wider than long, the apices almost truncate and with a row of spines near the margin. Length: male, 3.1 mm., female, 3.5 mm.

Not an *Eutettix*; but because of its establishment in economic literature under this name it is retained in the genus until proper disposition is made.

Not yet recorded in Minnesota. It may be found on sugar beets or wild hosts since it has been discovered in Illinois by DeLong and Kadow (1937). Ball (1907) discussed its life history. Oman (1936) discussed the distribution and synonymy.

Eutettix lurida (Van Duzee)1890. *Thamnotettix lurida* Van Duzee. Canad. Ent. 22:250.

Fulvous or testaceous brown, the fore wing fading to subhyaline toward costa. Distinctly marked by a white commissural spot and sometimes creamy yellow at apex of scutellum. Length: female, 5.75 mm.

Reported in Iowa and Wisconsin and should be found in Minnesota.

Eutettix marmorata Van Duzee1892. *Eutettix marmoratus* Van Duzee. Amer. Ent. Soc. Trans. 19:302.

Reddish brown, underlaid on crown, pronotum, and scutellum with pale yellow. Front yellowish, with testaceous arcs and sutures of face lined with dark brown. Fore wing irregularly brownish subhyaline, the dark brown nervures sharply contrasting. Length: male, 5 mm., female, 6 mm.

Specimens examined: 6; St. Peter and Ramsey County; July.

Eutettix querci Gillette and Baker⁶

(Pl. V, Fig. 10, 10A; Pl. VII, Fig. 12)

1895. *Eutettix querci* Gillette and Baker. Colo. Expt. Sta. Bul. 31:101.

Pale golden to greenish yellow, without markings. Fore wing pale straw, subhyaline, the dark bands of abdomen showing through, the nervures light yellow, sometimes irregularly margined with fuscous along the commissure, the apical cells usually infuscated. Length: male, 5.5 mm., female, 6 mm.

Specimens examined: 366; Minnesota City and Ramsey County; July.

Opsius Fieber

1866. Zool.-Bot. Gesell. Wien, Verhandl. 16:505.

GENOTYPE: *Opsius stactogalus* Fieber, 1866. Monobasic.

Wedge-shaped and relatively small leafhoppers; fore wing closely appressed to the body. Head broad and short, the crown longer medially than next to the eyes, in profile rounded to the front (Pl. V, Fig. 7). Fore wing opaque except apically and along the costal margin, with two antepical cells and distinct appendix.

Opsius stactogalus Fieber

(Pl. V, Fig. 7)

1866. *Opsius stactogalus* Fieber. Zool.-Bot. Gesell. Wien, Verhandl. 16:505.

Greenish, the crown and face pale, the pronotum and fore wing darker in color. Fore wing dark green, smoky at apex, mottled irregularly with small white spots, the apical and costal cells whitish hyaline. Length: male, 4.25 mm., female, 4.5 mm.

The writer collected adults and nymphs of this species on salt cedar (*Tamarix* sp.) September 29, 1939, at University Farm. A pair and one nymph placed in the Minnesota collection.

Specimens examined: 7; Ramsey County.

NORVELLINA Ball

1931. Fla. Ent. 15:1-2.

GENOTYPE: *Eutettix mildredae* Ball, 1901. Original designation.

Head equalling pronotum in width, the crown almost parallel margined, in profile broadly rounded or slightly angulate with front, with a narrow transverse depression from eye to eye just before the margin (Pl. IV, Fig. 10). Fore wing closely folded, slightly flared at apex, covered by reticulations which make a "saddle" pattern, the second cross vein absent (Pl. VI, Fig. 3).

⁶ The specimens placed here are not this species and have been described as new by Hepner (MS in press).

Lindsay (1940) revised this genus.

Most species are western or southwestern in distribution, but those found in Minnesota are included in the following key.

Key to Species

1. Base of clavus ivory white, or only faintly reticulate.....2
 Base of clavus heavily irrorate.....3
2. Female with a shallow median notch; male 5 mm. or more in
 length *novica*
 Female with a small median tooth; male 4.5 mm. or less in
 length *seminuda*
3. Dark chestnut brown, the reticulations at base of fore wing sharply
 margined by claval suture..... *scaber*
 Suffused with reddish reticulations, base of fore wing not margined
 at claval suture..... *chenopodii*

Norvellina novica n. sp.

(Pl. IX, Fig. 1)

Closely resembling *N. seminuda* (Say) in the pattern and color of markings, but larger, and with male and female genitalia different. Length: male, 5.5 mm., female, 5.75 mm.

Head slightly wider than pronotum. Crown roundly produced, a little longer medially than next to the eyes, and with a transverse shelflike depression just behind apex which runs nearly from eye to eye. Crown ivory yellow, with four small tawny spots on anterior margin, a slightly larger spot approximately behind each ocellus on posterior margin, and a spot covering the median suture. These markings may be faint. Pronotum ivory, lightly dotted with tawny irregular spots which are confluent in irregular bands. Scutellum ivory yellow, the lateral angles tawny, with a median fuscous band, except at the ivory apex. The part on the disc posterior to the transverse suture is very dark fuscous.

Fore wing ivory subhyaline, with a few fuscous irrorations at base. A distinct brown transverse band or "saddle" from middle of clavus to apex of clavus, gradually tapered to the costal margin. The anterior margins of band on clavus very dark brown, as are adjacent parts on corium and at apex of clavus. A small ivory spot in middle of band at commissure. Apex of fore wing with irregular brown vermiculations, nearly filling the outer and third apical cells, except for a round ivory spot in middle of outer apical cell at margin.

Genitalia: Sternite VII over twice the length of preceding segment, with a slight median keel which is more prominent posteriorly, the posterior margin convexly rounded, the edge slightly irregular, with a shallow median notch. Male valve nearly the

length of preceding segment; plate triangular with a narrow apex. In ventral view, the aedeagus with an elongate basal knob, the apex of which is slightly hooked anteriorly; from the basal knob arises an anterodorsally curved round shaft, flattened and bifid at apex, and two thin lateral processes upcurved in similar fashion but separated from and slightly longer than the central shaft. Pygofer with a group of bristles on the dorsoposterior margin and with a sharp spine on ventroposterior margin, the apex of the spine extending beyond the pygofer margin for about one third its length.

Type: female, Hennepin County, Minnesota, 2-VIII, 1920.

Allotype: male, Buffalo, New York, August 2, 1886.

Paratypes: one female, Hennepin County, Minnesota, VII-21-22; one female, Ramsey County, Minnesota, Mississippi River sand shore, July 8, 1922.

Type and paratypes in University of Minnesota collection; Allotype in United States National Museum collection.

Norvellina seminuda (Say)

(Pl. IV, Fig. 10; Pl. VI, Fig. 3)

1831. *Jassus seminudus* Say. Acad. Nat. Sci. Phila. Jour. 6: 307. (Also: 1891. Compl. Writ. 2:383.)

Milky white, the fore wing with a broad reddish-brown saddle across posterior half of clavus, the saddle narrowing toward the costa. Apex of fore wing with reticulations and slightly clouded with brown. Length: male, 4-4.5 mm., female, 5-5.25 mm.

Specimens examined: 1,310; Winona, Hennepin, Ramsey, Freeborn, Chisago, Steele, and Houston counties; June to the middle of August.

Norvellina chenopodii (Osborn)

1923. *Eutettix chenopodii* Osborn. Ohio Jour. Sci. 23:161.

Reddish brown, the crown, pronotum, and scutellum irrorate. Fore wing milky white, heavily marked with reticulations which form a saddle across clavus, narrowing at the costa; additional bandings at base and apex of fore wing. Length: male, 4-5 mm., female, 5-5.75 mm.

Collected on lamb's quarters. Fenton (1924) and Carpenter (1928) discussed the characteristic stigmonosis in *Chenopodium* sp. caused by its feeding.

Specimens examined: 1,713; Ramsey, Traverse, Renville, Norman, Steele, Polk, Pine, Hennepin, Le Sueur, and Chisago counties; last of June through August.

Norvellina scaber (Osborn and Ball)

1898. *Eutettix scaber* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:96.

Dark chestnut, the crown, pronotum, and scutellum heavily irrorate. Clavus brown, a saddle from posterior half narrowing toward the costa, the base of the clavus heavily margined along claval suture, and fore wing indefinitely banded at apex. Length: male, 5.25 mm.

Specimens examined: 3; Ramsey County.

MENOSOMA Ball

1931. Fla. Ent. 15:1, 4.

GENOTYPE: *Menosoma stonei* Ball, 1931. Original designation.

Crown slightly produced, broadly subconical, rounded to front without a transverse depression behind margin (Pl. IV, Fig. 11). Fore wing with simple venation, the second cross vein absent, the appendix distinct, outer apical veinlets reflexed, expanded on the costa, the costal area with about four extra veinlets which are broadened at the costa. The first cross vein is sometimes subdivided.

Menosoma cincta (Osborn and Ball)

(Pl. IV, Fig. 11)

1898. *Eutettix cincta* Osborn and Ball. Davenport Acad. Nat. Sci. Proc. 7:97.

Crown bluntly subconical, in lateral view sloping to the sub-acute margin. Brownish in color; fore wing with a broad fuscous band from posterior half of clavus, which slopes slightly backward to costa; about four reflexed black costal veinlets, which are widened along margin. Length: male, 5 mm., female, 6 mm.

Specimens examined: 16; Ramsey County.

PHLEPSIUS Fieber

1866. Zool.-Bot. Gesell. Wien, Verhandl. 16:503.

GENOTYPE: *Jassus intricatus* Herrich-Schaeffer, 1838. Monobasic.

Crown broad, as wide or wider than pronotum, varying in width and length, with the margin to front either rounded or acute (Pl. IV, Fig. 13). Fore wing with a distinct appendix, irrorate with numerous reticulations, but lacking the second cross vein (Pl. VI, Fig. 1). Usually some shade of brown; relatively large and robust species.

Ball (1918) and Osborn and Lathrop (1923) revised the genus. DeLong (1938b) figured the genitalia and gave a key to the males

based on characters of the internal genitalia. DeLong (1926c) discussed the host plants and habitats. The males of the *majestus* group in this genus were treated by DeLong (1939b) as members of the genus *Texananus*, which is not recognized by the writer.

Key to Species

1. Head narrower than pronotum 2
 Head as wide or wider than pronotum 5
2. Fore wing long and narrow 3
 Fore wing short and broad 4
3. Ventral process of aedeagus with bent terminal portion more than one third as long as basal portion **borrori**
 Terminal bent portion of aedeagus very short and thick **majestus**
4. Fore wing uniformly inscribed along commissure **cumulatus**
 Fore wing with distinct light areas along commissure **decorus**
5. Crown and pronotum much lighter in color than fore wing 6
 Crown and pronotum not distinctly contrasting in color with fore wing 8
6. Crown and pronotum ivory white **collitus**
 Crown and pronotum yellowish 7
7. Crown angulate, produced about two thirds its length before anterior margins of eyes **fulvidorsum**
 Crown blunt, produced about one half its length before anterior margins of eyes **hemicolor**
8. Fore wing with indications of two clear transverse bands; female genital segment with a deep rectangular notch **apertus**
 Fore wing without indications of transverse banding 9
9. Margin of crown with a polished black spot at either side of apex **lascivius**
 Crown without black spots at apex 10
10. General color cinereous, sparsely inscribed with vermiculations; a black spot at end of claval vein 11
 General color brownish, closely inscribed with vermiculations; no distinct black spot at end of claval vein 12
11. Plate pointed; male pygofer with a dorsal spine on posterior margin **certus**
 Plate nearly truncate; male pygofer without a spine **cinereus**
12. Crown rounded, not or only slightly angulate 13
 Crown angulate, definitely longer on the middle than next to the eyes 15
13. Species yellowish, 6.5 mm. or more in length **turpiculus**
 Species dark brown; less than 6.5 mm. 14
14. Crown with a broken ivory-white line on anterior margin; posterior margin of sternite VII with a broad, deep notch **incisus**
 Species ovate; sternite VII truncate between the prominent lateral lobes **altus**
15. 6.5 mm. or more in length **umbrosus**
 Usually less than 6.5 mm. in length 16
16. Sternite VII with a sharp median tooth in a median notch; male plates constricted near the middle to slender tips **irroratus**
 Species otherwise 17

17. Species dark, venter grayish green; sternite VII truncate posteriorly *truncatus*
 Species yellowish brown; sternite VII with prominent lateral lobes, the margin between them depressed and elevated medially *lobatus*

Phlepsius turpiculus Ball

1900. *Phlepsius turpiculus* Ball. Canad. Ent. 32:200.

Crown but little longer on the middle than next to the eyes, rounded to the front without a distinct margin. Light brown, with brown irrorations; the crown, pronotum, and scutellum distinctly lighter than fore wing. Posterior margin of sternite VII slightly notched in the middle, sinuate on either side, darkened with black; male valve triangular, the plate narrowed to an acute tip. Length: male, 6.5 mm., female, 7 mm.

Specimens examined: 95; St. Peter, Breckenridge, Olivia, Hennepin County, Wilkin County, Ramsey County, Shakopee, and Le Sueur County; July to September.

Phlepsius collitus Ball

1903. *Phlepsius collitus* Ball. Canad. Ent. 35:227.

A distinctly marked species; the crown, pronotum, and scutellum ivory white, the fore wing dark and densely reticulated. Posterior margin of sternite VII faintly notched medially, the margin to either side blackened. Plates about as broad as long, together triangular. Length: male, 5.75 mm., female, 6 mm.

Not recorded in Minnesota, but it should be found since it is in Iowa and Wisconsin.

Phlepsius cinereus Van Duzee

1892. *Phlepsius cinereus* Van Duzee. Amer. Ent. Soc. Trans. 19:68.

Light gray, the fore wing with a distinct blackish spot at end of claval vein. Crown parallel margined, rounded. Sternite VII with two small blackened teeth at either side of a shallow median notch. Plate exceeded slightly by pygofer, the tip almost truncate, with a slight tooth on the inner margin. Length: male, 5 mm., female, 6 mm.

This species may occur in Minnesota, but is unrecorded.

Phlepsius lascivius Ball

1900. *Phlepsius lascivius* Ball. Canad. Ent. 32:200.

Crown slightly longer on the middle than next to the eyes, rounded to front. Grayish white with dark brown irrorations, the apex of crown with a black spot on either side. Posterior

margin of sternite VII slightly produced on middle third, with a small median notch. Plates broad at base, distinctly divergent at the tips. Length: male, 6.25 mm., female, 6.5 mm.

Specimens examined: 51; Baudette, Crookston, and Ramsey County; July.

Phlepsius altus Osborn and Ball

1897. *Phlepsius altus* Osborn and Ball. Iowa Acad. Sci. Proc. 4:228.

Crown but little produced, bluntly angulate with front. Grayish in color, heavily irrorate with dark brown, the ocelli circled with white. Sternite VII with a truncate excavation between the blunt lateral lobes. Male valve short, plates together triangular, about twice the length of valve. Length: male and female, 6 mm.

Specimens examined: 25; Jordan, Owatonna, Anoka County, and Ramsey County; July and August.

Phlepsius incisus Van Duzee

1892. *Phlepsius incisus* Van Duzee. Amer. Ent. Soc. Trans. 19:73.

Crown but slightly longer on the middle than next to the eyes, in profile distinctly angled with the convex front. Grayish brown, the crown with an irregular ivory mark on anterior margin. Sternite VII notched on the middle, the outer border of lateral lobes edged with black. Plate long, sinuate from base to the roundly acute apex. Length: 6 mm.

Specimens examined: 1; Olmsted County.

Phlepsius irroratus (Say)

(Pl. IV, Fig. 13; Pl. VI, Fig. 1)

1831. *Jassus irroratus* Say. Acad. Nat. Sci. Phila. Jour. 6: 308. (Also: 1891. Compl. Writ. 2:384.)

Crown angulate, longer on the middle than next to the eyes, acutely angled with the front. Dark brown irrorations, the fore wing usually darkly marked. Posterior margin of sternite VII deeply notched, with a central median tooth. Plate sharply narrowed to about the middle, then straplike to the blunt point. Length: male and female, 6 mm.

Specimens examined: 39,749; throughout the state; May to September.

Phlepsius certus DeLong

1938. *Phlepsius certus* DeLong. Ohio Jour. Sci. 38:44.

Yellowish white, irrorate with brown. Crown only slightly produced on the middle, in lateral view bluntly angled with the

front. Plate long, slightly narrowed at middle, the apex bluntly pointed. Sternite VII produced on middle third, with a median notch, the rounded points at either side embrowned, the rounded lateral lobes giving the posterior margin a sinuate appearance. Length: female, 6.5 mm.

Specimens examined: 2; Washington and Ramsey counties; July.

Phlepsius truncatus Van Duzee

1892. *Phlepsius truncatus* Van Duzee. Amer. Ent. Soc. Trans. 19:72.

Crown angulate, about one fourth longer medially than next to the eye. Dark brown irrorate, the venter with a grayish-green cast. Sternite VII slightly raised on the posterior, truncate third, rounded on each side. Plate elongate, slightly narrowed to the blunt tip. Length: male, 5.5-6 mm., female, 6 mm.

Specimens examined: 355; Red Wing, Breckenridge, and Ramsey County; June and July.

Phlepsius lobatus Osborn

1898. *Phlepsius lobatus* Osborn. Iowa Acad. Sci. Proc. 5:247.

Crown slightly produced on the middle, in lateral view angulate with front. Yellowish brown, minutely irrorate with brown. Sternite VII depressed on posterior margin between prominent lateral lobes, slightly produced at middle with a median and lateral carinae. Plate short, narrowing abruptly to the blunt tip from a broad base. Length: female, 6.5 mm.

Specimens examined: 1; Ramsey County.

Phlepsius apertus Van Duzee

1892. *Phlepsius apertus* Van Duzee. Amer. Ent. Soc. Trans. 19:76.

Crown angulate, about one third longer medially than next to the eye, bluntly rounded to the front. Dark gray; fore wing dark fuscous, a poorly defined light band before middle and at apex. Sternite VII broadly rectangularly excavated to almost the base of the segment on middle third. Plate broad at base, abruptly narrowed near middle and extending beyond pygofer as a bluntly tipped, narrowly upturned process. Length: 5.75 mm.

Specimens examined: 8; Grand Marais, Lake County (Little Isabella River and Baptism Creek), and Cook County; August.

Phlepsius fulvidorsum (Fitch)

1851. *Jassus fulvidorsum* Fitch. Homop. N. Y. State Cab., p. 62.
(Also: 1893. N. Y. State Ent. Rpt. 9:402.)

Crown angulate, the margin at apex acute, more obtuse toward eye. Crown, pronotum, and scutellum light brown, contrasting

with the dark brown, heavily irrorate fore wing. Sternite VII with broad lateral lobes, the excavation nearly truncate, and with a slight notch. Plates broad at base, together triangular, with apices acute and upturned. Length: 6 mm.

This species was thought to be a cause of discoloration of blueberry leaves by Osborn (1915).

Specimens examined: 1; Willow River; August 7, 1922.

Phlepsius hemicolor Sanders and DeLong

1923. *Phlepsius hemicolor* Sanders and DeLong. Ent. Soc. Wash. Proc. 25:152.

Crown bluntly produced, forming a distinct margin with front. Posterior margin of sternite VII shallowly excavated on each side of a shallow median notch blackened on either side. Plate broad at base, gradually narrowed to the tip, and with an inwardly pointed apex. Length: female, 6.75 mm.

Specimens examined: 2; Olmsted and Norman counties; August.

Phlepsius umbrosus Sanders and DeLong

1917. *Phlepsius umbrosus* Sanders and DeLong. Ent. Soc. Amer. Ann. 10:88.

Crown obtusely angled, about twice as long at middle as next to the eye. A dark-brown species, the fore wing milky white, closely irrorate with brown. Sternite VII rounded behind, with a median notch forming two rounded lobes. Plate long, narrowed from base to a blunt point. Length: 7 mm.

Specimens examined: 5; Taylors Falls, Polk County, and Ramsey County; August.

Phlepsius cumulatus Ball

1900. *Phlepsius cumulatus* Ball. Canad. Ent. 32:202.

A stout, broadly oval species, the crown faintly angulate and nearly parallel margined. Grayish, with a reddish tinge, the crown with fuscous dots forming a transverse line. Posterior margin of sternite VII broadly notched at middle, and a smaller notch to each side. Plates together triangular, short, with slightly divergent acute tips. Length: male, 6 mm., female, 6.25 mm.

Specimens examined: 2; Baudette and Le Sueur County; July and August.

Phlepsius decorus Osborn and Ball

1897. *Phlepsius decorus* Osborn and Ball. Iowa Acad. Sci. Proc. 4:230.

A broad and short form, milky white in color, irrorate with

dark brown. Crown slightly longer on middle than next to the eyes, in profile angulate with front, the margin bluntly rounded. Sternite VII broad and short, with a deep circular notch extending halfway to base. Plate broad and short, convexly rounded to the angular point. Length: 6 mm.

Not represented in the Minnesota collection but described from Iowa and reported in Wisconsin.

Phlepsius majestus Osborn and Ball

1897. *Phlepsius majestus* Osborn and Ball. Iowa Acad. Sci. Proc. 4:229.

A large, reddish-brown species. Crown with a transverse dark brown band. Posterior margin of sternite VII with a median cleft; at each side of the notch is an acute point which rounds to the lateral angle. Plate narrow, elongate, acute at apex. Length: male, 8.5 mm.

Specimens examined: 1; Ramsey County.

Phlepsius borrori (DeLong)

1939. *Texananus borrori* DeLong. Ohio Jour. Sci. 39:237.

Crown slightly longer medially than next to the eye, marked with a broad dark-brown transverse band, interrupted at middle, broadened and bifid near the eyes. Posterior margin of sternite VII sinuate, with a narrow U-shaped notch on the middle, bordered by a tooth on each side. Plate long and slender, slightly exceeded in length by pygofer. Length: male, 9.5 mm.

A male paratype, Le Sueur County, July 28, 1922, is in the Minnesota collection.

PARAPHLEPSIUS Baker

1897. Canad. Ent. 29:158.

GENOTYPE: *Paraphlepsius ramosus* Baker, 1897. Original designation.

Relatively large species, with head wider than pronotum. Crown produced at least one half longer on the middle than next to the eyes; in profile showing a thin foliaceous margin (Pl. IV, Fig. 14).

DeLong (1938b) figured the genitalia of the species in this genus and presented a key to the males based on internal structures.

Key to Species

1. Large, 8.5 mm. or more; posterior margin of sternite VII raised between the lateral carinae; plates long, tapering to usually divergent tips*solidaginis*

- Smaller, usually less than 8 mm.; genitalia otherwise.....2
2. Crown angulately produced; most of its length before anterior margin of eyes**ramosus**
- Crown rounding; about half of its length before anterior margin of eyes3
3. Pronotum light yellow; sternite VII produced medially and notched**humidus**
- Pronotum dark brown; sternite VII with a wide, deep median notch**bifidus**

Paraphlepsius solidaginis (Walker)

1851. *Acocephalus Solidaginis* Walker. List Homop. Ins. Brit. Mus. 3:847.

1892. *Phlepsius nebulosus* Van Duzee. Amer. Ent. Soc. Trans. 19:77.

Crown produced, about twice longer on the middle than next to the eyes, in lateral view depressed before the thin, slightly upturned margin, and acutely angled with the front. Middle half of sternite VII elevated, truncate except for a slight median notch, the lateral margins prominently ridged. Plates long and exceeding pygofer in length, evenly tapering to the obtusely pointed tips which are usually divergent. Length: 8.5 mm.

Specimens examined: 81; Ramsey, Pope, Wright, Wilkin, Polk, Chippewa, Houston, and Olmsted counties; June and July.

Paraphlepsius humidus (Van Duzee)

(Pl. IV, Fig. 14)

1892. *Phlepsius humidus* Van Duzee. Amer. Ent. Soc. Trans. 19:76.

Crown obtusely angled, depressed before the thin and slightly upturned margin. Sternite VII produced at middle, and with a small median notch. Plate tapering to an acute tip. Length: 7 mm.

For many years this marsh species was misinterpreted by American authors and called *P. solidaginis*. *P. solidaginis* is now known to be the correct name for *P. nebulosus*.

Specimens examined: 40; Ramsey and Le Sueur counties; July and first of August.

Paraphlepsius bifidus (Sanders and DeLong)

1917. *Phlepsius bifidus* Sanders and DeLong. Ent. Soc. Amer. Ann. 10:89.

Crown about one third longer on the middle than next to the eye, the disc slightly depressed, the margin thin, in lateral view acutely angled with the front. Sternite VII deeply V-notched. Plate broad at base, narrowing sharply to the rounded tip. Length: male and female, 6.75-7 mm.

Specimens examined: 4; Cook County, Cascade River, Laporte, and Ramsey County.

Paraphlepsius ramosus Baker

1897. *Paraphlepsius ramosus* Baker. Canad. Ent. 29:158.

Pronotum distinctly carinate on lateral margins. The crown roundly angulate, depressed before the thin foliaceous margin, in lateral view acutely angled with the concave front. Sternite VII produced on middle half, with a small median notch and obtuse lateral angles. Plate broad at base, narrowed abruptly to the middle, then tapering to the blunt apex. Length: male, 7.5 mm., female, 8 mm.

Specimens examined: 1; Ramsey County.

IDIODONUS Ball

1936. Brooklyn Ent. Soc. Bul. 31:57.

GENOTYPE: *Jassus Kennicotti* Uhler, 1863. Original designation.

Crown obtusely angled, slightly longer on the middle than next to the eyes, in profile rounded over to the deep front (Pl. V, Fig. 14). Fore wing long and tapering, appressed near the apex, without the second cross vein. Usually reddish, or cinereous peppered with red, and with the posterior margin of sternite VII entire.

This genus was characterized by Ball (1936c) and new species included in it were added by Ball (1937).

Key to Species

1. Species 6 mm. or longer; pronotum with a light-colored transverse band *kennicotti*
- Species smaller, usually less than 5 mm. 2
2. Species minutely flecked with red dots 3
- Species without red flecks 4
3. Crown with two black spots on anterior margin *morsei*
- Crown without spots *cockerelli*
4. Crown with two black spots on anterior margin *belli*
- Crown without spots *belli* var. *brunneus*

Idiodonus kennicotti (Uhler)

(Pl. V, Fig. 14)

1863. *Jassus Kennicotti* Uhler. Amer. Ent. Soc. Proc. 2:161.

A large, reddish-brown species, distinctly marked; two black spots on anterior margin of crown, and a fulvous transverse band at base; pronotum with a yellowish-white band across the middle, and sometimes a narrower one on posterior margin. Sternite VII roundly produced, with two prominent carinae near apex, form-

ing a median keel. Plate broad at base, tapering to an attenuated sharply pointed tip. Length: male, 6 mm., female, 6.25 mm.

Specimens examined: 19; Ramsey, Cook, Mille Lacs, Crow Wing, Lake, Red Lake, Faribault, Wilkin, Todd, Cass, and Hubbard counties; July, August, and September.

Idiodonus morsei (Osborn)

1915. *Thamnotettix morsei* Osborn. Maine Agr. Expt. Sta. Bul. 238:134.

Crown with two black spots on margin close to front. Yellowish brown in color, minutely flecked with crimson dots. Length: 5.25 mm.

Not in the Minnesota collection but reported from Wisconsin by Sanders and DeLong (1917).

Idiodonus cockerelli (Ball)

1900. *Thamnotettix Cockerelli* Ball. Canad. Ent. 32:339.

Brown, the head and pronotum minutely flecked with blood red. Fore wing with red dots along the veins. Length: male, 5 mm., female, 5.5 mm.

Specimens examined: 2; Grand Marais, August 13, 1922; Cook County (Beaver Dam), August 12, 1922.

Idiodonus belli (Uhler)

1877. *Jassus belli* Uhler. U. S. Geol. and Geog. Survey Bul. 3:471.

A light-yellow species, the crown with two small round black spots on margin. A distinct yellow band across head and pronotum. Length: male, 4.25-5 mm.

Specimens examined: 5; Itasca Park, Cass County, Houston County, and Carlton County; May and June.

Idiodonus belli var. *brunneus* (Osborn)

1915. *Thamnotettix belli* var. *brunneus* Osborn. Maine Agr. Expt. Sta. Bul. 238:135.

Similar to *belli* in form, but crown without the black spots, and pronotum without the yellow band. Fore wing rich brown, fading toward the apex.

Specimens examined: 2; Itasca Park and Ramsey County; June.

COLLADONUS Ball

1936. Brooklyn Ent. Soc. Bul. 31:57.

GENOTYPE: *Thamnotettix collaris* Ball, 1902. Original designation.

Head narrower than pronotum, broadly subconical in shape, the crown slightly longer on the middle than next to the eyes (Pl. V, Fig. 13). Fore wing closely folded behind, the appendix distinct, the second cross nervure absent. Posterior margin of sternite VII incised, with a median straplike projection. Plates together spoon-shaped, the apices sharp. Usually recognized by the "saddle" of the fore wing and the highly contrasting colors.

Key to Species

1. Fore wing with tips of claval veins and part of costal margin white *waldanus*
Species otherwise; usually a saddle across clavus 2
2. Species dark brown, sometimes black 3
Dark brown replaced by light golden brown 5
3. Fore wing without a saddle *montanus* var. *reductus*
Fore wing with a saddle 4
4. Saddle broad; crown usually unicolorous *clitellarius*
Saddle narrow; crown darkened by a posterior band *montanus*
5. Anterior margin of crown with two black spots; saddle prominent *clitellarius* var. *marcidus*
Spots absent or small; saddle narrow or absent *montanus* var. *mulsus*

Colladonus waldanus (Ball)

1903. *Thamnotettix waldana* Ball. Canad. Ent. 35:229.

A testaceous brown species, the crown pale yellow with a trace of rusty brown posteriorly. Fore wing with tips of claval veins and part of costal margin white. Length: female, 5 mm., male, 4.5 mm.

Specimens examined: 1; Kawishiwi River; August 28, 1919.

Colladonus clitellarius (Say)

(Pl. V, Fig. 13)

1831. *Jassus clitellaria* Say. Acad. Nat. Sci. Phila. Jour. 6: 309. (Also: 1891. Compl. Writ. 2:384.)

Brownish black and bright lemon yellow. Crown yellow, with two black spots on anterior margin. Pronotum yellow, with a black anterior band. Fore wing black, with a prominent yellow spot covering most of clavus, and most of costal area hyaline. Length: male, 4.25-4.5 mm., female, 5-5.25 mm.

Specimens examined: 629; throughout the state.

Colladonus clitellarius var. *marcidus* Ball

1937. *Colladonus clitellarius* var. *marcidus* Ball. Brooklyn Ent. Soc. Bul. 32:29.

Typically the same form and markings of *clitellarius*, but the dark brown replaced by light golden brown.

Specimens examined: 4; Marshall, St. Anthony Park, Hallock, and Winona County; August and September.

Colladonus montanus (Van Duzee)

1892. *Thamnotettix montanus* Van Duzee. Canad. Ent. 24: 268.

General appearance dark brown. Crown yellow, darkened at base with brown, and often with two small black spots at apex. Fore wing dark, with a definite saddle on clavus. Pronotum yellow, darkened at anterior and posterior margins with brown. Length: male and female, 4.5-5 mm.

Severin (1934) discussed the transmission of aster yellows by this species, and gave several host plants.

Specimens examined: 5; Clearwater County, Lutsen, Itasca Park, and Ramsey County; July and August.

Colladonus montanus var. *reductus* (Van Duzee)

1917. *Thamnotettix montanus* var. *reductus* Van Duzee. Calif. Acad. Sci. Proc., Ser. 4, 7:298.

Typically like *montanus* but fore wing entirely dark brown, the saddle being obscured. Crown with a definite brown band at base and along anterior margin of pronotum. The brown band on base of crown sometimes reduced to a dark line next to the eye and a geminate spot on the middle.

Specimens examined: 1; Norman County; August 1, 1923.

Colladonus montanus var. *mulsus* Ball

1937. *Colladonus montanus* var. *mulsus* Ball. Brooklyn Ent. Soc. Bul. 32:29.

Typically like *montanus* but the dark-brown markings replaced by light or golden brown. Pronotum with a brown band on anterior and posterior margins. Saddle of fore wing distinct or obscure.

Specimens examined: 1; Norman County; September 30, 1922.

DOLERANUS Ball

1936. Brooklyn Ent. Soc. Bul. 31:58.

GENOTYPE: *Thamnotettix longulus* Gillette and Baker, 1895. Original designation.

Head narrower than pronotum and angulately pointed; crown with a submarginal brown line and traces of irregular markings on each side of median line; two dots on disc of scutellum. Fore wing with central anteapical cell somewhat constricted medially and then enlarged posteriorly, the veins margined with dark.

Sternite VII without a straplike process in median notch; plates short and triangular and not folded into a spoonlike structure.

This genus is not recorded in Minnesota, but *Doleranus longulus* (Gillette and Baker) is reported from Iowa.

ATANUS Oman

1938 (1936). Kans. Univ. Sci. Bul. 24:381.

GENOTYPE: *Eutettix dentatus* Osborn, 1923. Original designation.

Head about same width as pronotum. Crown longer medially than next to the eyes, in profile nearly flat, meeting the long and narrow front without a distinct margin. Fore wing with simple venation, lacking the second cross vein; the outer anteapical cell with sides nearly parallel, shorter, and more slender than inner anteapical cell.

Not represented in Minnesota, but *Atanus perspicillatus* (Osborn and Ball) is reported from Iowa.

THAMNOTETTIX Zetterstedt

1838. Ins. Lapp., column 292.

GENOTYPE: *Cicada prasina* Fallén, 1806. Subsequent designation.

Elongate robust species, usually uniformly colored and without distinctive markings. Crown short, slightly longer medially than next to the eyes, in lateral view rounded to the front without a distinct margin. Fore wing long, appendix distinct, with four apical and three anteapical cells, and without the second cross vein.

Thamnotettix simplex (Herrich-Schaeffer)

1834. *Jassus simplex* Herrich-Schaeffer. Panzer Ins. Germ., Heft. 125, tab. 7.

A rather large, robust species, with the crown acutely angled, brownish, immaculate. Fore wing hyaline, darkly smoky. Pronotum and scutellum olive green, the scutellum with two round black spots, usually faint. Length: male, 5.75 mm., female, 6 mm.

Specimens examined: 3; Lake County, Cook County, and Grand Marais (Gunflint trail); July and August.

ACINOPTERUS Van Duzee

1892. Psyche 6:307.

GENOTYPE: *Acinopterus acuminatus* Van Duzee, 1892. Monobasic.

Easily recognized species with fore wing moderately long and narrowed to a point apically, the nervures very distinct. Head narrower than pronotum, the crown short and bluntly angled.

Not yet recorded in Minnesota, but the genotype is reported from Wisconsin and may be found here. Beamer and Lawson (1938) discussed this genus.

ELYMANA DeLong

1936. Ohio Jour. Sci. 36:218.

GENOTYPE: *Thamnotettix inornatus* Van Duzee, 1892. Original designation.

Long, slender species similar to some species of *Laevicephalus*. Head pointed, the crown angled and in profile sharply angled with the front. Fore wing long and narrow, without the second cross vein. Sternite VII with posterior margin sinuate, almost truncate. Male pygofer long, tapered to a pointed spine on the dorsal margin. Usually found on *Elymus* grasses.

DeLong (1936) discussed the genus and figured the characters.

Elymana inornata (Van Duzee)

1892. *Thamnotettix inornatus* Van Duzee. Amer. Ent. Soc. Trans. 19:303.

Dull yellow, tinged with green, immaculate, the crown distinctly angled in front. Posterior margin of sternite VII almost truncate, with a brown spot either side of the middle point. Male pygofer rounded to a dorsal posterior black spine, usually visible in ventral view extending beyond the obtusely angled plates. Length: male, 4.5-4.75 mm., female, 5-5.5 mm.

Found on *Calamagrostis canadensis* according to DeLong (1923).

Specimens examined: 44; Cook County, Kawishiwi River, White Bear, Lake County, Norman County, Cramer, Grand Marais, and Ramsey County; July to September.

GRAMINELLA DeLong

1936. Ohio Jour. Sci. 36:218.

GENOTYPE: *Thamnotettix aureovittus* Sanders and DeLong, 1920. Original designation.

Relatively small species common in marshes and wet prairies; grass feeders in so far as known. Resembling species of *Laevicephalus* in the slightly produced and bluntly angled crown, rounded to the front without a thick margin (Pl. IV, Fig. 12). Venation simple, the fore wing with second anteapical cell slightly constricted medially (Pl. VII, Fig. 6). Minnesota species are usually

recognizable by the row of small dots just above anterior margin of crown.

DeLong and Mohr (1937) revised the genus and figured genitalia.

Key to Species

1. Pronotum unicolorous; nervures concolorous with yellow fore wing **nigrifrons**
 Pronotum with lineate markings; fore wing brownish, the nervures paler 2
2. Species 5 mm., darkly yellowish brown **ampla**
 Species smaller, usually more yellowish 3
3. Six spots on crown, often faintly marked; species less than 4 mm. in length **pallidula**
 Four spots on crown, usually conspicuous; species more than 4 mm. in length **fitchii**

Graminella nigrifrons (Forbes)

(Pl. IV, Fig. 12; Pl. VII, Fig. 6)

1885. *Cicadula nigrifrons* Forbes. Ill. State Ent. Rpt. 14:67.

Yellowish green with four black round spots just above margin, extending over to a spot next to each eye in ocellular area. Sutures of face usually black, with black arcs on front. Pronotum and scutellum yellow, immaculate. Fore wing long, yellowish, with three anteapical cells, and without the second cross vein. Length: male, 3.5-3.75 mm., female, 4-4.5 mm.

Specimens examined: 51,368; Breckenridge, Wabasha County, and Ramsey County; June and July.

Graminella fitchii (Van Duzee)

1890. *Thamnotettix fitchii* Van Duzee. Ent. Amer. 6:133.

Yellowish green, sometimes straw-colored, the fore wings brown-tinged, with pale conspicuous nervures. Crown with a triangular pair of black spots near apex and a round spot next to each eye in ocellular area. Pronotum longitudinally marked with five pale stripes. Sternite VII with median tooth; plates one and one-half longer than their combined basal width.

Specimens examined: 870; Hennepin, Ramsey, Wilkin, Le Sueur, Todd, and Scott counties; July.

Graminella pallidula (Osborn)

1898. *Thamnotettix pallidula* Osborn. Iowa Acad. Sci. Proc. 5:245.

Pale yellow, with six small black spots aligned along margin of the crown, often obscure or sometimes obsolete. Pronotum with faint orange stripes. Sternite VII deeply excavated on

posterior margin, and with a small median tooth. Plates short, equal in length to their combined basal width. Length: male, 3.25 mm.

Specimens examined: 1; Isanti County; September 21, 1939.

Graminella ampla Beamer

1938. *Graminella ampla* Beamer. Canad. Ent. 70:229.

Brownish yellow, the fore wing brownish. Crown with four black spots just above anterior margin, pronotum with seven white longitudinal stripes, contrasting sharply with underlying color. Length: male, 4.5-4.75 mm., female, 5-5.25 mm.

Specimens examined: 28; Crookston, Breckenridge, Wilkin County, and Ramsey County; July.

CICADULA Zetterstedt

1838. Ins. Lapp., column 296.

GENOTYPE: *Cicada quadrinotata* Fabricius, 1794. Subsequent designation.

Dr. P. W. Oman has called the attention of the writer to the fact that *Cicadula* is the correct name of this genus.

Green or yellowish species, occurring in fresh water marshes on *Cyperus*, other sedges, and grasses. Usually immaculate, except for black spots or bands on anterior margin of the crown. Crown bluntly angulate, longer medially than next to the eyes. Fore wing long, narrow, with four apical and three anteapical cells, and lacking the second cross vein (Pl. VI, Fig. 11).

DeLong (1937c) reviewed North American species in this genus (as *Cyperana*) and figured the internal male genitalia.

Key to Species

1. Crown without markings (Subg. *Paluda*)..... **mellus**
Crown with black stripes or spots..... 2
2. Pronotum with longitudinal brownish stripes, the markings on margin of crown thin and linear..... 3
Pronotum without stripes, the crown margin immaculate or with distinct spots 4
3. Four linear lines on margin of crown..... **cyperacea**
Lines on margin of crown forming a continuous band..... **vittipennis**
4. Markings on margin of crown forming a band..... **smithi**
Markings on crown in the form of spots..... 5
5. Size 6.5-7 mm..... **straminea**
Size 6 mm. or less..... 6
6. Two spots only on margin, and a spot behind each ocellus..... **decipiens**
Four spots on margin of crown..... 7
7. Heavy black markings behind ocelli..... **eruca**

- Without distinct black markings behind ocelli 8
 8. Ocelli black, the crown not sharply angled *ciliata*
 Ocelli not black, the crown sharply angled *melanogaster*

Cicadula cyperacea (Osborn)

(Pl. VI, Fig. 11)

1898. *Thamnotettix cyperaceus* Osborn. Iowa Acad. Sci. Proc. 5:245.

Tawny, the crown and pronotum with three parallel reddish-brown stripes, the central stripe not as broad as those on each side. Margin of crown with four black dashes. Length: male, 5-5.25 mm., female, 5.25-5.75 mm.

Specimens examined: 33; Ramsey County, Lake Minnetonka, and Mora; June to September.

Cicadula vittipennis (Sanders and DeLong)

1917. *Thamnotettix vittipennis* Sanders and DeLong. Ent. Soc. Amer. Ann. 10:91.

Tawny, the crown and pronotum with three parallel reddish-brown longitudinal stripes. Margin of crown with a thin black band. Fore wing subhyaline, with brown bands giving it a striped appearance. Length: male, 5-5.5 mm., female, 5.75-6 mm.

Specimens examined: 13; Kawishiwi River and Lake Itasca; August.

Cicadula straminea (Sanders and DeLong)

1917. *Thamnotettix stramineus* Sanders and DeLong. Ent. Soc. Amer. Ann. 10:90.

Yellowish orange, sometimes faded. A large and fairly robust species marked on margin of crown by four spots, the center pair being much longer than those next to the eyes. Posterior margin of sternite VII slightly excavated, with a black raised disc embossed with deep striae on each side of middle. Male pygofer long, black at extreme tip. Length: male, 5.25-5.75 mm., female, 5.5-6 mm.

Specimens examined: 6; Traverse County, Kawishiwi River, and Ramsey County; August.

Cicadula melanogaster (Provancher)

1872. *Jassus melanogaster* Provancher. Nat. Canad. 4:378.

Greenish yellow, with crown distinctly angled, the anterior margin with four large rectangular spots equidistant from each other. Length: male, 4.5 mm., female, 4.75 mm.

Specimens examined: 51; Lake, Hennepin, Ramsey, Todd, Kanabec, and Chisago counties; June to September.

Cicadula ciliata (Osborn)

1898. *Thamnotettix ciliata* Osborn. Iowa Acad. Sci. Proc. 5:244.

Yellowish-green, with four round black spots on margin of crown and rarely with two additional spots behind the black ocelli. Length: male, 4.5 mm., female, 4.75-5 mm.

Specimens examined: 12; Ramsey County.

Cicadula smithi (Van Duzee)

1892. *Thamnotettix Smithi* Van Duzee. Canad. Ent. 24:266.

Greenish yellow, the fore wing darkly green, smoky-tinged at apex. Crown green with a broad black band on margin from eye to eye. Length: male, 4.75 mm., female, 4.75-5 mm.

Found on *Spartina michauxiana* according to DeLong (1923).

Specimens examined: 79; Mora and Ramsey County; June.

Cicadula decipiens (Provancher)

1890. *Thamnotettix decipiens* Provancher. Pet. Faune Ent. Canad. 3:285. (1889, Old Ed., p. 284.)

Yellowish green, the margin of crown with a pair of large round black spots at apex and a black spot posterior to each ocellus. Fore wing greenish, iridescent. Length: male, 4.75 mm., female, 5.25 mm.

Specimens examined: 3; Grand Marais, Carlton County (Elk-horn Creek), and Lake County (Little Isabella River); August.

Cicadula eruca (DeLong)

1937. *Cyperana eruca* DeLong. Amer. Midland Nat. 18:231.

Greenish yellow to orange, heavily marked with black. Margin of crown with four quadrate black spots, the central pair larger than those next to the eyes; sometimes the spots are confluent. A small black dash just behind each ocellus. Length: male, 4.75-5 mm., female, 5.25-5.5 mm.

Specimens examined: 266; Norman, Todd, Marshall, Hennepin, Polk, Lake, Ramsey, and Clearwater counties; June to October. A series of darkly marked forms from Grand Marais, August 13, 1922, are placed here, after an examination of the male genitalia, although the markings closely follow *montula* DeL.

Cicadula (Paluda) mellus (Sanders and DeLong)

1905. *Thamnotettix placidus* Osborn. N. Y. State Ent. Rpt. 20:536.

1917. *Thamnotettix mellus* Sanders and DeLong. Ent. Soc. Amer. Ann. 10:91.

1924. *Thamnotettix placatus* Baker. Philippine Jour. Sci. 24:367.

Orange yellow, without markings, the crown broadly rounded and scarcely angled. Posterior margin of sternite VII broadly

excavated about half its length. Plate long, tapered to a blunt apex, each bearing a black tooth on the dorsal side. Pygofer terminating in a bladelike process, the black-tipped apex extending beyond the plate. Length: male, 4.5 mm., female, 5 mm.

Specimens examined: 15; Cook and Lake counties; August.

CHLOROTETTIX Van Duzee

1892. *Psyche* 6:306.

GENOTYPE: *Bythoscopus unicolor* Fitch, 1851. Original designation.

Species large and robust, usually green or greenish yellow. Crown broad, of nearly uniform length throughout its width, scarcely produced anteriorly, in lateral view broadly rounded to the front. Fore wing hyaline, long, with a well-developed appendix, three anteapical cells, and lacking an extra cross vein (Plate I).

This genus was revised by DeLong (1919) and the male genitalia were figured by DeLong and Cartwright (1926). Brown (1933) and DeLong (1937a) described new species. DeLong (1937b) discussed synonymy in the genus.

Key to Species

1. Species brownish or sordid dark green.....2
Species uniformly green or yellowish green.....3
2. Uniform sordid green, the fore wing often appearing almost black.....*tergatus*
Brown, the fore wing reddish.....*lusrorius*
3. Crown nearly parallel margined, in profile broadly curved to the front.....4
Crown at least one third longer medially than next to the eyes, in profile bluntly angulate with the front.....5
4. Notch in sternite VII with a median spatulate process; plate long and gradually tapered to a sharp apex.....*spatulatus*
Notch of sternite VII without a process; plate narrowed at about half its length, then produced.....*unicolor*
5. Length 6.5 mm. or less.....*galbanatus*
Length 7 mm. or more.....6
6. Sternite VII with a spatulate process in a broad notch; male valve broad and short, angular behind.....*balli*
Sternite VII without a process in a black-bordered notch, shallowly emarginate either side; male valve rounded behind.....*nudatus*

Chlorotettix tergatus (Fitch)

1851. *Bythoscopus tergatus* Fitch. Homop. N. Y. State Cab., p. 58. (Also: 1893. N. Y. State Ent. Rpt. 9:398.)

A large robust species, the crown but slightly longer medially than next to the eyes. Almost uniformly dark green, the fore

wing usually dark smoky, sometimes almost black. Length: male, 7 mm., female, 7-7.25 mm.

Specimens examined: 17; White Bear, Princeton, Hennepin County, Fort Snelling, and Ramsey County; July.

Chlorotettix spatulatus Osborn and Ball

1897. *Chlorotettix spatulata* Osborn and Ball. Iowa Acad. Sci. Proc. 4:225.

A large uniformly green species, often yellowish-tinged; the crown broad and but slightly longer at the middle than next to the eye. Sternite VII broadly notched more than half its length, with a median spatulate process two thirds the length of the notch and broadened toward the apex. Plate broad at the base, narrowed to an acute tip, exceeded in length by the pygofer. Length: male, 6.5 mm., female, 7-8 mm.

Specimens examined: 3; St. Peter, Willow River, and Ramsey County; July and August.

Chlorotettix unicolor (Fitch)

(Pl. I; Pl. II, Fig. 1)

1851. *Bythoscopus unicolor* Fitch. Homop. N. Y. State Cab., p. 58. (Also: 1893. N. Y. State Ent. Rpt. 9:398.)

A large uniformly green species, sometimes faded yellowish. Crown broad, scarcely produced medially. Sternite VII long with a very broad V-shaped notch almost one third its length. Plates broad at base, rather abruptly narrowed to a subacute apex, greatly exceeded in length by pygofer which in lateral view is rounded behind. Length: female and male, 7-7.5 mm.

Specimens examined: 334; throughout the state.

Chlorotettix lusorius (Osborn and Ball)

1897. *Thamnotettix lusoria* Osborn and Ball. Iowa Acad. Sci. Proc. 4:226.

Olive brown, the fore wing subhyaline, with a distinct reddish tinge. Crown with a faint transverse band before the eyes. Length: 7-8 mm.

Brown (1933) reported examining specimens from Minnesota, but this species is not represented in our collection.

Chlorotettix galbanatus Van Duzee

1892. *Chlorotettix galbanatus* Van Duzee. Psyche 6:310.

Crown obtusely angled, longer at the middle than next to the eyes. Posterior margin of sternite VII deeply incised at the middle, the lobes rounded to either side. Plate long, evenly rounded from the base to a sharply pointed apex, the margin

thickly clothed with hairs. Length: female, 6.25 mm., male, 6 mm.
Specimens examined: 1; Ramsey County.

Chlorotettix balli Osborn

1898. *Chlorotettix balli* Osborn. Iowa Acad. Sci. Proc. 5:246.

Yellowish green, the crown bluntly angled, longer medially than next to the eyes. Sternite VII with spatulate process as in *spatulatus* but the notch deeper and wider, and the process only half the length of the notch, not broadened toward the apex. Plate but little exceeded by pygofer, the tip obtuse and upturned. Length: male, 6.5 mm., female, 6.75 mm.

Specimens examined: 4; Washington County, Willow River, and Ramsey County; July.

Chlorotettix nudatus Ball

1900. *Chlorotettix nudata* Ball. Canad. Ent. 32:340.

Crown twice longer at the middle than next to the eyes. Species pale green, the crown and face with an orange cast, and a slightly fulvous tinge to the pronotum and fore wing. Posterior margin of sternite VII darkened, with a narrow median notch, shallowly concave to each side. Plate broad at base, gradually narrowed to an acute tip. Length: 7.5 mm.

This species was described from Iowa, and it probably will be found in Minnesota.

MACROSTEELES Fieber

1866. Zool.-Bot. Gesell. Wien, Verhandl. 16:504.

GENOTYPE: *Cicada sexnotata* Fallén, 1806. Subsequent designation.

Usually slender species, rarely over 5 mm. in length. Crown distinctly produced, longer at the middle than next to the eyes, and usually spotted or dashed with black (Pl. V, Fig. 15). Fore wing overlapped apically, with two anteapical and four apical cells, and the appendix distinct (Pl. VI, Fig. 8).

Dorst (1937) reviewed this group and erected the genera *Davisonia* and *Sonronius*, but the writer does not follow this separation, and they are included here as subgenera of *Macrosteles*.

Key to Species

1. Large and robust species, the crown nearly parallel margined (Subg. *Davisonia*)2
- Smaller and more slender species, the crown definitely produced in front4
2. Length 4-5 mm. snowi
- Length 5 mm. or over3

- | | |
|--|-------------------|
| 3. Apex of crown not distinctly spotted..... | <i>americana</i> |
| Apex of crown with a pair of spots..... | <i>major</i> |
| 4. Fore wing yellow, the clavus brown..... | <i>clavatus</i> |
| Fore wing otherwise..... | 5 |
| 5. Less than 3 mm. in length..... | <i>potorius</i> |
| More than 3 mm. in length..... | 6 |
| 6. Crown but slightly produced; a round black spot above each ocellus..... | <i>arcuatus</i> |
| Crown distinctly produced, marked other than above..... | 7 |
| 7. Ocelli enclosed by lineate dashes, except on margin between..... | 8 |
| Ocelli not enclosed, a pair of black spots on margin between..... | 9 |
| 8. Size more than 5 mm..... | <i>fascifrons</i> |
| Size less than 5 mm..... | <i>divisus</i> |
| 9. A black dash between eye and ocellus..... | <i>lepidus</i> |
| No black marking between eye and ocellus..... | <i>variatus</i> |

Macroteles (Davisonia) major (Dorst)

(Pl. V, Fig. 16)

1931. *Cicadula major* Dorst. Kans. Ent. Soc. Jour. 4:43.

Tawny yellow. Crown marked by a large spot behind each ocellus and a variable sized pair of spots on apex just above margin. Fore wing milky yellow; in the male heavily striped with dark brown along yellow nervures; lighter brown in female. Length: male, 5-5.5 mm., female, 7 mm.

According to Dorst (1931) the male holotype, Ramsey County, February, 1922, and paratypes, Ramsey County, July, 1922, are in the Snow Entomological collection. Presumably part of the same series (February ?) examined in the Minnesota collection: 26; Ramsey County, July 18, 1922. Other specimens examined: 18; Le Sueur, Rock, Sibley, Washington, and Winona counties.

Macroteles (Davisonia) americana (Van Duzee)1891. *Cicadula punctifrons* var. *americana* Van Duzee. Canad. Ent. 23:169.

Dull yellowish brown, the fore wing of female with nervures yellow, heavily margined with dark brown. Crown with a pair of large black spots behind ocelli, the apex embrowned, but lacking distinct spots; genae with an irregular black spot below base of antennae. Sternite VII strongly medially produced on posterior margin. Length: female, 6 mm.

Specimens examined: 3; Mora, Ramsey County, and Winona County; July.

Macroteles (Davisonia) snowi (Dorst)1931. *Cicadula snowi* Dorst. Kans. Ent. Soc. Jour. 4:41.

Yellow, except for two large black spots near anterior margin of crown. Fore wing whitish hyaline, smoky at apex. Posterior

margin of sternite VII with a V-shaped notch at middle. Length: 4-5 mm.

Reported on *Salix* in Wisconsin and Montana and should be found in Minnesota.

Macrosteles (Sonronius) clavatus (DeLong and Davidson)

1934. *Cicadula clavata* DeLong and Davidson. N. Y. Ent. Soc. Jour. 42:223.

Golden yellow, the crown with a large black spot behind each ocellus and black on genae at base of antennae. Fore wing orange yellow, hyaline, smoky at apex, the entire claval area dark brown. Length: male, 3.75 mm.

Specimens examined: 2; Sedan and Mora; June and July.

Macrosteles (Sonronius) arcuatus (Gillette and Baker)

1895. *Cicadula arcuata* Gillette and Baker. Colo. Expt. Sta. Bul. 31:105.

Crown bluntly produced, about one third longer at the middle than next to the eyes; yellow, sometimes tinged with orange, with a round black spot behind each ocellus, usually two small spots next to each eye, the lower one extending around the base of antennae. Pronotum greenish yellow, sometimes maculated with an arcuate, transverse black line almost parallel with the anterior margin. Fore wing pale green, hyaline, the nervures yellowish. Length: male, 4.25-4.5 mm.; female, 4.75 mm.

Specimens examined: 44; Cook County (Beaver Dam), and Ramsey County; August.

Macrosteles potorius (Ball)

1900. *Cicadula potoria* Ball. Canad. Ent. 32:346.

Small, dark; the crown, pronotum, and scutellum mostly black; female with a median longitudinal yellow line from apex of crown to tip of scutellum and a pair of oblique yellow dashes near posterior margin of crown. Crown of male black except for yellow dashes connecting ocelli; pronotum with a longitudinal yellow line irregularly edged with black; scutellum black, except for yellow lateral edges. Fore wing hyaline, smoky. Length: male and female, 2.75 mm.

Reported on *Juncus* by Osborn (1915).

Specimens examined: 3; Ramsey County.

Macrosteles variatus (Fallén)

1806. *Cicada variata* Fallén. Svenska Vetensk. Akad., Handl. 27:34.

Crown angularly produced, yellowish, marked with a pair

of large black spots on anterior margin and a pair near posterior margin. Basal angles of scutellum dark, a portion showing through pronotum. Fore wing greenish hyaline, usually smoky, with a white spot in middle of clavus. Length: male, 3.75-4 mm., female, 4.5 mm.

Specimens examined: 716; Lake County, Crookston, St. Paul, and Ramsey County; July and August.

Macrosteles lepidus (Van Duzee)

1894. *Cicadula lepida* Van Duzee. Canad. Ent. 26:139.

Crown sharply, angularly produced, yellow-green, marked as in *variatus* but with a black dash between ocellus and eye. Fore wing greenish, smoky hyaline, the nervures pale. Length: male, 3.75 mm., female, 4-4.25 mm.

Specimens examined: 19; Ramsey County.

Macrosteles fascifrons (Stål)

1858. *Thamnotettix fascifrons* Stål. Stettin Ent. Ztg. 19:194.

Tawny yellow, resembling *divisus* but larger and with different internal male genitalia. Crown with a wide black band on anterior margin, sometimes interrupted medially; black between eyes and ocelli and a black lineate dash posterior to each ocellus, in the male merged with the marginal band so that the ocelli are completely enclosed. Two round spots near posterior margin of crown. Basal angles of scutellum black, except along the margin. Sutures and arcs of face heavily blackened. Fore wing with fuscous patches and smoky apically. Ventral shaft of aedeagus heavy, terminating in two slender processes which abruptly bend ventrally and posteriorly to three fourths the length of the shaft, with sharpened tips widely separated in lateral view. Sternite VII with a median notch on posterior margin. Length: male, 5 mm., female, 5.5 mm.

Specimens examined: 3; Crookston; July 3, 1937.

Macrosteles divisus (Uhler)

(Pl. V, Fig. 15; Pl. VI, Fig. 8)

1877. *Jassus divisus* Uhler. U. S. Geol. and Geog. Survey Bul. 3:472.

Yellowish green, characteristically marked on crown by black dashes and spots as follows: a transverse pair of dashes below and above each ocellus, a pair of dashes on margin next to each eye, and a pair of small round spots near the posterior margin. Sutures of face and arcs of front black. Fore wing greenish yellow, often smoky apically. Length: male, 3.75-4 mm., female, 4-5 mm.

Osborn (1915) observed that the injury to oats by this species is associated and probably followed by an attack of rust or other fungus diseases. It is economically important as a vector of the aster yellows virus.

Specimens examined: 254,972; throughout the state; May to October.

Subfamily BALCLUTHINAE Baker

1923. *Balcluthini* Baker. Philippine Jour. Sci. 23:374.

Key to Genera

Head narrower than pronotum (Pl. III, Fig. 13).....	Balclutha
Head wider than pronotum (Pl. III, Fig. 14).....	Nesosteles

BALCLUTHA Kirkaldy

1900. Entomologist 33:243.

GENOTYPE: *Cicada punctata* Thunberg, 1784. Monobasic.

Elongate, small leafhoppers with head narrower than pronotum. Crown about one third the length of pronotum, roundly produced and longer medially than next to the eye (Pl. III, Fig. 13). Fore wing longer than abdomen; the appendix distinct and closely overlapped apically with two anteapical and three apical cells (Pl. VI, Fig. 5). Hind wing with three apical cells.

Davidson and DeLong (1935) reviewed this genus and figured the male genitalia.

Key to Species

1. Species about 3 mm.; crown with anterior margin produced; plate shorter than pygofer..... **abdominalis**
- Species about 4 mm.; crown nearly parallel margined; plate of same length as pygofer..... 2
2. Aedeagus with a short tapered tip extending anteriorly halfway to posterior margin of preceding segment **punctata**
- Aedeagus with a long and slender tip extending anteriorly to posterior margin of preceding segment..... 3
3. Yellowish green **impicta**
- Dark green mottled with brown **impicta** var. **maculata**

Balclutha abdominalis (Van Duzee)

1892. *Gnathodus abdominalis* Van Duzee. Canad. Ent. 24:113.

Pale, dirty white; crown bluntly produced more than half its length before anterior margin of eyes. Plate shorter than pygofer, abruptly narrowed to a slender tip. Length: 3 mm.

Specimens examined: 2; Cook County, August 5, 1939; Winona County, July 1, 1922.

Balclutha impicta (Van Duzee)

(Pl. III, Fig. 13 and Pl. VI, Fig. 5)

1892. *Gnathodus impictus* Van Duzee. Canad. Ent. 24:113.

Greenish yellow, with distinctive male genitalia; in lateral view the aedeagus enlarged at base, abruptly narrowed to a long and rounded process extended dorsally, then abruptly curved anteriorly into the preceding abdominal segment. Length: 4 mm.

Specimens examined: 50; Ramsey, Chisago, Winona, Todd, Hennepin, Anoka, Mille Lacs, Washington, and Clearwater counties; last of June through middle of August.

Balclutha impicta var. *maculata* Davidson and DeLong1935. *Balclutha impicta* var. *maculata* Davidson and DeLong. Ent. Soc. Wash. Proc. 37:101.

Bright green, with varying degrees of brown mottling on crown, pronotum, and fore wing.

Specimens examined: 5; Hennepin, Houston, and Fillmore counties; April and May.

Balclutha punctata (Thunberg)1784. *Cicada punctata* Thunberg. Nova Acta Soc. Sci. Upsala 4:21.

Green, with brown mottlings on crown, pronotum, and fore wing. Pronotum with a median longitudinal line. In lateral view the male aedeagus with a broad, elongated base, gradually tapering to a slender point which is curved dorsally and posteriorly to about the middle of the segment. Length: 4 mm.

Specimens examined: 63; Carlton, Clearwater, Goodhue, Dakota, Kittson, Pine, Mille Lacs, Chisago, St. Louis, Houston, Olmsted, Cook, Lake, and Ramsey counties; May through August.

NESOSTELES Kirkaldy

1906. Hawaii. Sugar Planters' Assoc. Expt. Sta., Div. Ent. Bul. 1(9):343.

GENOTYPE: *Nesosteles hebe* Kirkaldy, 1906. Original designation.

Small slender species, with the head broader than pronotum, the crown short and broad, and not produced medially (Pl. III, Fig. 14). Fore wing long and exceeding abdomen, with two anteapical and four apical cells (Pl. VI, Fig. 12). Hind wing with three apical cells.

Davidson and DeLong (1935) reviewed the species in this genus (as *Agellus*) and figured the genitalia.

Nesosteles neglectus (DeLong and Davidson)

(Pl. III, Fig. 14 and Pl. VI, Fig. 12)

1933. *Eugnathodus neglecta* DeLong and Davidson. Ohio Jour. Sci. 33:55.

Slender, pale, the fore wing whitish subhyaline, sometimes smoky apically. Crown sometimes greenish- or brownish-tinged, with three faint longitudinal reddish stripes. Length: 3.25 mm.

This common species in Minnesota has been observed on grass hosts.

Specimens examined: 752; throughout the state.

Subfamily CICADELLINAE Van Duzee

1916. *Cicadellinae* Van Duzee. Check List Hemiptera, p. 65.Key to Genera⁷

1. Fore wing with an appendix (Fig. 1)..... **Alebra**
Fore wing without an appendix..... 2
2. Hind wing with a submarginal vein (Figs. 3A, 5A)..... 3
Hind wing without a submarginal vein (Figs. 6A, 7A)..... 6
3. Hind wing with one apical cell (Fig. 3A); usually uniformly light-green species with hyaline fore wing..... **Empoasca**
Hind wing with two apical cells (Fig. 5A); species usually colored otherwise 4
4. Fore wing with third apical cell triangular, pedicellate anteriorly (Fig. 2) **Alconeura**
Fore wing with third apical cell rectangular, and with a cross vein anteriorly (Figs. 4, 5), except in *D. maculata*..... 5
5. Plates caliperlike; sternite VII with a large median lobe; fore wing with cross vein of outer apical cell sometimes absent, the third cross vein more caudad than the second (Fig. 5)..... **Forcipata**
Plates triangular, contiguous along their inner margins; fore wing with cross vein of outer apical cell distinct (Fig. 4)..... **Dikraneura**
6. Hind wing with three apical cells (Fig. 6A)..... **Cicadella**
Hind wing with two apical cells (Fig. 7A)..... 7
7. Fore wing with third apical cell triangular, pedicellate, or sessile anteriorly (Fig. 8)..... **Typhlocyba**
Fore wing with third apical cell otherwise (Figs. 7, 9); usually highly ornamented species 8
8. Scutellum thickened and elevated posteriorly; fore wing with red dots (Fig. 7)..... **Hymettia**
Scutellum otherwise **Erythroneura**

ALEBRA Fieber

1872. Katalog Cicadinen, p. 14.

GENOTYPE: *Cicada albostriella* Fallén, 1826. Subsequent designation.

Ocelli present, the head broadly blunt, narrower than pro-

⁷ All figures referred to are on plate VIII.

notum. Fore wing slender, exceeding abdomen, and folded behind, with a distinct appendix prolonged around apex (Pl. VIII, Fig. 1). Hind wing with a submarginal vein, three apical cells.

McAtee (1926a) reviewed this genus.

Key to Varieties of *Alebra albostriella* (Fallén)

- | | |
|--|-------------------|
| 1. Without distinct yellow, smoky, or red markings | pallidula |
| With color markings | 2 |
| 2. Fore wing deep smoky | fumida |
| Fore wing yellow or orange | 3 |
| 3. Front yellow or orange yellow | fulveola |
| Front heavily splashed with red | rubrafrons |

Alebra albostriella var. *pallidula* (Walsh)

(Pl. VIII, Fig. 1)

1862. *Typhlocyba pallidula* Walsh. Prairie Farmer (n.s. 10)
26:147-149. (Also: 1864. Boston Soc. Nat. Hist. Proc.
9:315.)

Uniformly whitish, the fore wing semihyaline, except for the hyaline apical cells. Male with traces of a yellow vitta along the commissure of fore wing.

Specimens examined: 15; Ramsey County.

Alebra albostriella var. *fulveola* (Herrich-Schaeffer)

1838. *Typhlocyba fulveola* Herrich-Schaeffer. Fauna Ins.
Germ., Heft 164, No. 16.

Uniformly orange yellow, the fore wing pale apically. Length: male, 3.5 mm., female, 4 mm.

Specimens examined: 39; Ramsey County; July.

Alebra albostriella var. *rubrafrons* DeLong

1918. *Alebra albostriella* var. *rubrafrons* DeLong. Ohio Jour.
Sci. 18:240.

Yellowish, except for the distinctly red-tinged front. Length: male, 3.5 mm.

Specimens examined: 3; Ramsey County.

Alebra albostriella var. *fumida* Gillette

1898. *Alebra fumida* Gillette. U. S. Natl. Mus. Proc. 20:714.

Dark smoky, the yellow crown and pronotum washed with smoky; fore wing deep smoky to blackish, the color deepest on clavus and near tip. Length: 3.75 mm.

Reported for Minnesota by DeLong and Caldwell (1937c).

DIKRANEURA Hardy

1850. Tyneside Nat. Field Club Trans. 1:423.

GENOTYPE: *Dikraneura variata* Hardy, 1850. Monobasic.

Small, slender, and with a conical head; crown acutely angled or roundly produced. Fore wing usually subopaque and greenish, closely folded and pointed behind, without an appendix, with four apical cells, the second cell being long and rectangular (Pl. VIII, Fig. 4). Hind wing with a submarginal vein, two apical cells.

Ball and DeLong (1925) revised the genus, and DeLong and Caldwell (1937a) presented a key to the species based on the internal male genitalia. Two subgenera are found in Minnesota.

Key to Species

1. Species with red spots or stripes; fore wing whitish hyaline; cross veins nearly in a straight line (subg. *Dikraneura* Hardy) 2
 Species usually uniformly greenish; fore wing subopaque; second and third cross veins distinctly caudad to the first and fourth (subg. *Chloroneura* Walsh) 3
2. Fore wing spotted with red; third apical cell triangular **maculata**
 Fore wing with oblique red stripes; third apical cell rectangular **cruentata**
3. Species broad, unicolorous milky white; posterior margin of sternite VII broadly bilobed with the margin darkened; plates broad at base, with slender divergent apices **mali**
 Species slender, pale yellow or green, often with red or white stripes 4
4. Species unicolorous 5
 Species with some markings, usually red stripes 6
5. Robust; plates with bluntly pointed apices; posterior margin of sternite VII convexly rounded, not darkened **urbana**
 Slender; plates with slender divergent apices; sternite VII concave and darkened medially **angustata**
6. Fore wing pale green **abnormis**
 Fore wing marked with red 7
7. Pale greenish, with a smoky face and dark venter **carneola**
 Yellowish marked with red **rubrala**

Dikraneura maculata Gillette

1898. *Dicraneura* [sic] *maculata* Gillette. U. S. Natl. Mus. Proc. 20:716.

Pale yellow, conspicuously red-spotted. Crown with curved red lines on posterior margin; pronotum crossed by an orange-yellow band. Basal part of each fore wing with about six large maculae and a few small red dots which become numerous along the white nervures of the apical half. Length: 3 mm.

Specimens examined: 3; Ramsey County and Hennepin County on *Rumex*; October. Reported on hackberry in eastern U. S.

Dikraneura cruentata Gillette

1898. *Dicraneura* [sic] *cruentata* Gillette. U. S. Natl. Mus. Proc. 20:717.

Pale yellow to white, strikingly marked with red stripes: medially on crown, one on each side of pronotum, and a narrow

oblique pair on each fore wing. The color intensity of the stripes varies, and in some specimens may be pale yellow. Length: 2.75 mm.

Specimens examined: 13; Ramsey, Chisago, Goodhue, Dakota, Hennepin (on *Rumex*), and Washington counties; May to October.

Dikraneura (Chloroneura) abnormis Walsh

1862. *Chloroneura abnormis* Walsh. *Prairie Farmer* (n.s. 10) 26:147-149. (Also: 1864. *Boston Soc. Nat. Hist. Proc.* 9:316.)

Slender, pale green, washed with yellow. Crown and pronotum with a pair of longitudinal red stripes, which sometimes are bordered with white lines. Aedeagus branched laterally at apex, each branch bifurcate, with a long spine posteriorly and a shorter spine anteriorly. Length: 3.5 mm.

An eastern species reported from Iowa and Wisconsin but so far not recorded from Minnesota.

Dikraneura (Chloroneura) angustata Ball and DeLong

1925. *Dikraneura angustata* Ball and DeLong. *Ent. Soc. Amer. Ann.* 18:328.

Slender, yellowish, the fore wing subhyaline and bluish green. Aedeagus with a pair of spines at apex, directed posteriorly. Spine of ninth segment long and slender, sharply curved inwardly and anteriorly. Length: male, 3 mm., female, 3.25 mm.

Specimens examined: 14; Pope and Ramsey counties; September.

Dikraneura (Chloroneura) rubrala DeLong and Caldwell

1937. *Dikraneura (Notus) rubrala* DeLong and Caldwell. *Ent. Soc. Wash. Proc.* 39:26.

Resembling *carneola*, but differently colored and with distinctive genitalia. Yellowish, the fore wing reddish with the commissure and claval area white. Plate long and narrow, the apex blunt. Aedeagus with a pair of lateral processes arising near apex, the latter with two broad diverging spines. Length: 3.2 mm.

The holotype male and allotype female of this species were described from Taylors Falls.

Dikraneura (Chloroneura) carneola (Stål)

1858. *Typhlocyba carneola* Stål. *Stettin Ent. Ztg.* 19:196.

Robust, soiled greenish, with a smoky face and dark venter. Crown and anterior half of pronotum usually with a light median line, and fore wing before the cross nervures irrorate with red. Plate narrowly triangular, the apex blunt. In lateral view, the

spines of ninth segment curved dorsally, the aedeagus V-shaped, with the apex tapering and slightly hooked. Length: 3.5 mm.

According to Ball and DeLong (1925) specimens from Minnesota (Lawson) were examined.

Dikraneura (Chloroneura) urbana Ball and DeLong

1925. *Dikraneura abnormis* var. *urbana*, Ball and DeLong.
Ent. Soc. Amer. Ann. 18:329.

Slender, pale yellow, resembling *abnormis* but without the red stripes and with different male genitalia. Aedeagus with a pair of bifurcate processes at apex, the smaller pair directed anteriorly and ventrally, the larger pair extended posteriorly. Length: male and female, 3.25 mm.

Specimens examined: 3; Lake and Ramsey counties; August.

Dikraneura (Chloroneura) mali (Provancher)

(Pl. VIII, Fig. 4)

1890. *Erythroneura mali* Provancher. Pet. Faune Ent. Canad.
3:298.

Broad, milky white, easily recognized by its form and color. Plates broad at base, abruptly rounded to the divergent, upturned, narrow apices. Posterior margin of sternite VII dark brown, appearing lobed on each side of the shallow median concavity. Length: male, 3.75 mm., female, 4 mm.

Specimens examined: 24; Hennepin, Olmsted, Mille Lacs, Ramsey, Lake, Washington, Morrison, and Cook counties; April to August. Easily collected early in the spring by sweeping grass.

FORCIPATA DeLong and Caldwell

1936. Ent. Soc. Amer. Ann. 29:70.

1942. Ent. Soc. Amer. Ann. 35:49.

GENOTYPE: *Forcipata loca* DeLong and Caldwell, 1936. Subsequent designation.

Species of this genus are yellow; crown bluntly angled. Fore wing yellowish hyaline, the fourth (outer) cross vein sometimes absent, the second cross vein offset posteriorly to the first (inner) and the third offset posteriorly to the second cross vein (Pl. VIII, Fig. 5). Plates cylindrical, caliperlike, bowed outwardly at middle, but with apices and bases proximal. Posterior margin of sternite VII usually with a prominent median lobe.

DeLong and Caldwell (1936) proposed this genus to include several species and figured the male genitalia.

Key to Species

1. Species usually 3.5 mm. or more in length; plate with a prominent black sharp-pointed spine on the inner margin near the apex *loca*

- Species smaller, plate otherwise.....2
2. Plates strongly bent inwardly, almost right-angled at about two thirds their length; sternite VII with a long and narrow median lobe*calipera*
- Plates may be bowed but not angularly bent; sternite VII with median lobe short and wide.....3
3. Plates bowed; median lobe of sternite VII rounded.....*acclina*
- Plates not bowed; median lobe of sternite VII almost truncate*triquetra*

Forcipata loca DeLong and Caldwell

(Pl. VIII, Fig. 5, 5A)

1936. *Forcipata loca* DeLong and Caldwell. Ent. Soc. Amer. Ann. 29:71.

Orange yellow, the fore wing subhyaline, with yellow nervures. Plate bearing a sharply pointed and blackened spine on inner margin near apex. Length: 3-3.25 mm.

Previously known in America as *Dikraneura fieberi* Löw.

Specimens examined: 1,175; Lake, Cook, Anoka, Washington, Ramsey, Pope, and Houston counties.

Forcipata triquetra DeLong and Caldwell

1936. *Forcipata triquetra* DeLong and Caldwell. Ent. Soc. Amer. Ann. 29:72.

Resembling *loca* but with a blunter crown and a more slender appearance. Plate but little bowed, the apex without a blackened spine as in *loca*, but with two small sharp-pointed teeth on inner margin near apex. Length: 3 mm.

Specimens examined: 7; Isanti, Anoka, and Ramsey counties; September.

Forcipata acclina DeLong and Caldwell

1936. *Forcipata acclina* DeLong and Caldwell. Ent. Soc. Amer. Ann. 29:74.

Yellowish; crown bluntly angled, produced about two thirds of its length before the anterior margins of the eyes. Plates abruptly bent outwardly and curved inwardly at about half their length, the apices facing each other, concave between a sharp tooth at each margin. Length: 3.2 mm.

According to DeLong and Caldwell (1936) this species was described from a series of specimens taken at Taylors Falls.

Forcipata calipera DeLong and Caldwell

1936. *Forcipata calipera* DeLong and Caldwell. Ent. Soc. Amer. Ann. 29:74.

Orange yellow; basal half of fore wing opaque; the apical half hyaline and only the veins yellowish. Sternite VII with a

narrow median lobe, the lateral lobes about two thirds its length. Plates abruptly, almost right-angularly, curved inward at about two thirds their length, the apices almost touching. Length: 3.2 mm.

Specimens collected at Taylors Falls were used in the description of this species according to DeLong and Caldwell (1936).

ALCONEURA Ball and DeLong

1925. Ent. Soc. Amer. Ann. 18:324, 334.

GENOTYPE: *Alconeura rotundata* Ball and DeLong, 1925. Original designation.

Small, robust, and highly ornamented leafhoppers, which resemble *Dikraneura*. Hind wing with a submarginal vein and two apical cells. Fore wing with four apical cells, the third apical cell triangular, the margining nervures coalesced and pedicellate posterior to cross veins. Fore wing usually with a characteristic dark dot near inner apical vein in inner apical cell (Pl. VIII, Fig. 2).

Griffith (1936) revised this genus and figured the male genitalia. No species of the genus are represented in the Minnesota collection, but the genotype, *Alconeura rotundata* Ball and DeLong (Pl. VIII, Fig. 2), was described from Iowa and should be found in this state.

EMPOASCA Walsh

1862. Prairie Farmer (n.s. 10) 26:149. (Also: 1864. Boston Soc. Nat. Hist. Proc. 9:316.)

Genotype: *Tettigonia fabae* Harris, 1841. Subsequent designation.

Usually small, delicate species of some shade of green. Fore wing without an appendix, the veins inconspicuous at the base. Hind wing with a submarginal vein, and one apical cell (Pl. VIII, Fig. 3, 3A). The species are very similar in size and markings, and accurate identifications are made only by the study of the internal male genitalia.

The genus *Empoasca* was last revised by DeLong (1931). Species described since by DeLong and associates are found in a series of papers: namely, I, Ohio Jour. Sci. 32:393-401, 1932; III, *ibid.*, 35:29-39, 1935; IV, *ibid.*, 36:225-230, 1936; V, *ibid.*, 38:90-96, 1938; VI, *ibid.*, 39:110-118, 1939; and II, Ent. Soc. Amer. Ann. 27: 604-609, 1934. Poos (1933) added new species. Oman and Wheeler (1938) revised the species in the *aspersa* group. Balduf (1934) studied the taxonomic value of the ovipositor in some species.

Key to Species

1. Crown distinctly angulately produced, never parallel margined, the basal width usually not exceeding one and one-half times the median length (subg. *Empoasca*).....13
 Crown broadly rounded, almost parallel margined, or if bluntly produced, the basal width about twice the median length.....2
2. Species usually less than 3 mm. in length; crown slightly roundly produced, but not parallel margined (subg. *Hebata* DeL.)**coccinea**
 Species more than 3 mm. in length; the crown broadly rounded, almost parallel margined (subg. *Kybos* Fieb.).....3
3. Plate parallel margined, about five times as long as basal width; posterior margin of sternite VII usually notched or lobed (*maligna* group)4
 Plate broad at base and tapered to apex, usually heavily armed with spines; sternite VII entire (*obtusa* group).....7
4. Claval vein blue to bright red.....5
 Uniformly green, without markings, except for a black spot before inner apical cell of fore wing.....6
5. Dark green, the claval suture bluish; sternite VII obliquely notched at either side of a sunken median tooth.....**atrolabes**
 Reddish brown; sternite VII without a notch.....**unica**
6. Sternite VII with a median U-shaped notch; a large black spot just before cross vein of inner apical cell.....**pergandei**
 Sternite VII with an oblique notch either side of a sunken median tooth.....**maligna**
7. Fore wing with distinct dark markings.....8
 Fore wing immaculate.....10
8. Fore wing with a dark stripe along the commissure.....**smaragdula**
 Fore wing without a longitudinal stripe.....9
9. Green, with three transverse black bands.....**trifasciata**
 Grayish, with a brownish band across pronotum; fore wing with smoky patches.....**copula**
10. Fore wing green, pale white along claval suture.....**albolinea**
 Species otherwise.....11
11. Brownish; lateral process at pygofer evenly narrowed to a blunt tip, the dorsal spine thick.....**luda**
 Green or yellow; lateral process of pygofer abruptly narrowed near the tip, the dorsal spine narrow.....12
12. Apex of lateral process of pygofer sinuate, directed laterally in ventral view.....**patula** var. **magna**
 Apex of lateral process of pygofer abruptly narrowed and slightly hooked in lateral view.....**gelbata**
13. Fore wing with irregular smoky or brown mottling (*birdii* group) 14
 Fore wing green or yellowish without brown spotting (*fabae* group)17
14. In ventral view, lateral processes of pygofer distinctly and broadly curved, usually twice overlapping each other.....**curvata**
 In ventral view, lateral processes straight or nearly so.....15
15. Dorsal spine long and thornlike apically.....**recurvata**
 Dorsal spine thick, not thornlike apically.....16

16. In ventral view, lateral processes of pygofer gradually sloping together, closest near the abruptly divergent apices.....*ditata*
 In ventral view, lateral processes of pygofer abruptly sloping together, contiguous from near the middle to the apices.....*vergena*
17. In ventral view, lateral processes of pygofer practically straight, evenly narrowed to the apex.....18
 In ventral view, lateral process enlarged, curved, hooked, or abruptly narrowed at apex.....19
18. Dorsal spine long and gradually narrowed to the anteriorly directed tip*filamenta*
 Dorsal spine curved inwardly and upon itself, the tip directed posteriorly*torqua*
19. In ventral view, lateral processes crossing each other.....20
 In ventral view, lateral processes not crossed.....22
20. Lateral processes crossed only at apices.....*pergrada*
 Lateral processes crossed near half their length.....21
21. Dorsal spine abruptly narrowed, thornlike, and heavily pigmented apically*deluda*
 Dorsal spine broad and gradually narrowed, not heavily pigmented apically*curvatura*
22. Apices of lateral processes divergent, in ventral view.....*distracta*
 Apices of lateral processes contiguous or convergent, in ventral view23
23. Dorsal spine evenly narrowed to the ventrally directed tip; in ventral view, lateral processes crossed by styles over a slight inflation on inner margins, the apices evenly narrowed, forcepslike.....*fabae*
 Dorsal spine narrowed at base, the long thin tip curved anteriorly; lateral processes otherwise.....24
24. Dorsal spine smoothly, evenly curved.....*pallida*
 Dorsal spine flattened, angulately curved.....*erigeron*

Empoasca (Kybos) pergandei Gillette

1898. *Empoasca pergandei* Gillette. U. S. Natl. Mus. Proc. 20:735.

Pale green, sometimes yellowish. Fore wing with a black spot just before cross vein of inner apical cell. Posterior margin of sternite VII with a median U-shaped notch. Length: 3.75 mm.

Specimens examined: 40; Olmsted County, Cramer, and Ramsey County; August.

Empoasca (Kybos) maligna (Walsh)

1862. *Chloroneura maligna* Walsh. Prairie Farmer (n.s. 10) 26:147-49. (Also: 1864. Boston Soc. Nat. Hist. Proc. 9:317.)

Bright green, usually with the apical portion of fore wing smoky. Posterior margin of sternite VII with a central sunken tooth, and an oblique notch to each side. Valve of male with a deep V-shaped notch, the plate long and narrow. Length: 3.5 mm.

Specimens examined: 48; Cramer, Olivia, Willow River, and Ramsey County; June to August.

Empoasca (Kybos) unica (Provancher)

1890. *Typhlocyba unica* Provancher. Pet. Faune Ent. Canad. 3:340.

Crown yellowish anteriorly, dark green posteriorly; pronotum bluish green on the posterior margin, reddish orange on the anterior two thirds; fore wing yellowish brown to reddish, deep blue along the claval suture, smoky at apex; a dark spot anterior to inner cross vein.

Specimens examined: 2; Hubbard County, July 8, 1936; Kashiwi River, August 30, 1919.

Empoasca (Kybos) atrolabes Gillette

1898. *Empoasca atrolabes* Gillette. U. S. Natl. Mus. Proc. 20:736.

Dark green, the fore wing sometimes smoky near apex; claval vein bluish green, and a black spot anterior to cross vein of inner apical cell. Sternite VII with a broad sunken tooth, and an oblique notch on each side. Length: 3.5 mm.

Specimens examined: 73; throughout the state; June, July, and August. This species is found on alder.

Empoasca (Kybos) gelbata DeLong and Davidson

1936. *Empoasca gelbata* DeLong and Davidson. Ohio Jour. Sci. 36:225.

Large, broad-headed, dull greenish to yellow. In lateral view, the lateral process of the pygofer is broad, abruptly narrowed near the apex to a slightly curved slender tip. Dorsal spine narrow and sickle-shaped, curved anteriorly. Length: 4 mm.

Specimens examined: 35; Polk, Clearwater, Ramsey, Cook, Anoka, Norman, and Steele counties; June through August.

Empoasca (Kybos) patula var. *magna* DeLong

1931. *Empoasca patula* var. *magna* DeLong. U. S. Dept. Agr. Tech. Bul. 231:23.

Greenish, sometimes faded to yellow; usually with three white spots on anterior margin of pronotum, and a broad white spot on scutellum between orange-tinged basal angles. Lateral process of pygofer long and slender, the tip sinuate, in ventral view deflected outward. Styles irregularly margined, the tips hooked outward. Dorsal spine slender and curved slightly anteriorly. Length: male, 4 mm., female, 5 mm.

Specimens examined: 3,464; Mille Lacs, Anoka, Ramsey, Polk, Rice, Steele, and Hennepin counties; June to August.

Empoasca (Kybos) albolinea Gillette

1898. *Empoasca albolinea* Gillette. U. S. Natl. Mus. Proc. 20:732.

Greenish, tinged with yellow; crown sometimes with a white median line and oblique white dashes to each side; fore wing pale greenish yellow, hyaline toward the apex, conspicuously marked with pale white along the claval suture. Length: female, 3.5 mm.

Specimens examined: 5; Ramsey County.

Empoasca (Kybos) luda Davidson and DeLong

1938. *Empoasca luda* Davidson and DeLong. Ohio Jour. Sci. 38:94.

Large, broad-headed, with distinct coloration; fore wing dull green, with brown veins; crown, pronotum, and scutellum brownish and marked with pale yellow areas. Lateral process of pygofer straight with a bluntly pointed tip. Dorsal spine broad, with a thick anteriorly curved hook. Length: male, 4 mm.

Specimens examined: 1; Ramsey County.

Empoasca (Kybos) smaragdula (Fallén)

1806. *Cicada smaragdula* Fallén. Svenska Vetensk. Akad. Handl. 27:37.

Bright green, sometimes faded to yellow; a black stripe extending from posterior portion of pronotum, across scutellum, and along the commissure of fore wing to apex of clavus. Length: 3.5-4 mm.

This species was collected in abundance by the writer on narrow-leaved willow in Chisago County during August.

Specimens examined: 64; Itasca Park, St. Paul, and Ramsey County; July and August.

Empoasca (Kybos) trifasciata Gillette

1898. *Empoasca trifasciata* Gillette. U. S. Natl. Mus. Proc. 20:726.

Green, sometimes yellowish, marked by three transverse black bands: one across posterior half of pronotum, a median one across fore wing at middle of clavus, and a broad band across apex of fore wing. Length: 4 mm.

The writer has collected this species commonly on broad-leaved cottonwood (*Populus deltoides*) at University Farm during July.

Specimens examined: 16; Ramsey County (Grey Cloud Island) and St. Anthony Park; July.

Empoasca (Kybos) copula DeLong

1931. *Empoasca copula* DeLong. U. S. Dept. Agr. Tech. Bul. 231:27.

Brownish, with the crown golden yellow, the pronotum and scutellum dark brown. Fore wing grayish hyaline, irregularly smoky on the clavus and across the apex. Length: male, 3 mm. Specimens examined: 2; Itasca County; August 4, 1939.

Empoasca (Hebata) coccinea (Fitch)

1851. *Empoa coccinea* Fitch. Homop. N. Y. State Cab., p. 63.
(Also: 1893. N. Y. State Ent. Rpt. 9:403.)

Green, with a reddish tinge; the fore wing greenish, tinged with smoky. Aedeagus with a pair of long slender processes arising from the base. Lateral process of the pygofer very short. In ventral view the styles are broadly curved outward. Length: female, 3.5 mm.

Unique in its pine host and the structure of the aedeagus.

Specimens examined: 2; Ramsey County (Pine Plantation); July 10, 1929.

Empoasca recurvata DeLong

1931. *Empoasca recurvata* DeLong. U. S. Dept. Agr. Tech. Bul. 231:38.

Pale green, tinged with yellow; pronotum with three spots on anterior margin. Fore wing greenish subhyaline, clouded with smoky brown. Styles long and slender, the tips in ventral view curved outward. Lateral process of pygofer narrowed from a broad base, the apical portion curved abruptly upward with the tip slightly bent anteriorly, in lateral view. Dorsal spine large basally, abruptly narrowed, the slender tip curved anteriorly. Length: male, 3 mm.

Specimens examined: 2; Houston County; May 20, 1938.

Empoasca ditata DeLong and Caldwell

1934. *Empoasca ditata* DeLong and Caldwell. Ent. Soc. Amer. Ann. 27:606.

Pale greenish, with white dashes on crown and three white spots on anterior margin of pronotum. Fore wing greenish hyaline, with irregular smoky patches. In ventral view, style curved outward at apex; lateral process of pygofer long, abruptly bent outward at tip. Dorsal spine with a long broad base; sharply pointed and directed anteriorly and ventrally. Length: 3 mm.

Specimens examined: 6; Olmsted, Hennepin, and Houston counties; April to June.

Empoasca vergena DeLong and Caldwell

1934. *Empoasca vergena* DeLong and Caldwell. Ent. Soc. Amer. Ann. 27:607.

Green, resembling *ditata* and *recurvata*, but the fore wing usually more heavily marked with smoky brown. In ventral view, styles broad at base, evenly narrowed to the outwardly curved tips; lateral processes of pygofer long, converging at middle, then slightly curved to the sharply pointed contiguous tips. Dorsal spine very broad, the apex hooked ventrally. Length: male, 3.25 mm., female, 3.5 mm.

Specimens examined: 4; Hennepin County; April 30, 1938.

Empoasca curvata Poos

1933. *Empoasca curvata* Poos. Ent. Soc. Wash. Proc. 35:177.

Green, tinged with yellow. Crown with a white median line, and a pale area in front of each ocellus; pronotum with three white spots on anterior margin. Fore wing greenish, subhyaline, with irregular areas washed with smoky brown. Styles in ventral view divergent, the lateral processes long and slender, in ventral view curved so as to cross each other near the middle, then re-crossing near the apices, the tips directed laterad. Length: 3.5 mm.

Specimens examined: 2; Hennepin County, April 30, 1938; Lake County, August 20, 1938.

Empoasca filamenta DeLong

1931. *Empoasca filamenta* DeLong. U. S. Dept. Agr. Tech. Bul. 231:43.

Green, sometimes faded to yellow. Crown with a white median stripe, and a pair of oblique white dashes to each side; scutellum with a white longitudinal stripe. In ventral view, styles curved outward at tips which are slightly ventrally bent; lateral process of pygofer long and slender, the tips attenuate. Dorsal spine broad at base, evenly curved to the sharp tip which is extended anteriorly. Length: 3.5 mm.

According to DeLong (1931) this species is abundant in the western states on potatoes, beans, and sugar beets.

Specimens examined: 1; Itasca Park; June 15, 1937.

Empoasca deluda DeLong

1931. *Empoasca deluda* DeLong. U. S. Dept. Agr. Tech. Bul. 231:46.

Bright green, resembling *fabae* in general appearance. In ventral view, styles enlarged near base, then gradually tapered

to the slightly outwardly curved tips. Lateral processes of pygofer long and slender, crossing each other near the middle and abruptly bent inwardly toward each other near the apices. Dorsal spine broad at base, with a heavy thornlike tip directed anteriorly and slightly ventrad. Length: 3.5 mm.

Specimens examined: 2; Wadena County on alfalfa, June 26, 1924; Red Lake County on alfalfa, August 15, 1924.

Empoasca torqua DeLong and Davidson

1935. *Empoasca torqua* DeLong and Davidson. Ohio Jour. Sci. 35:35.

Greenish yellow, immaculate, except for three white spots on anterior margin of pronotum and dashes on crown. In ventral view, styles with divergent apices; lateral processes of pygofer but little longer than the styles, slender, evenly narrowed to the sharply pointed tips. Dorsal spine narrowed from the broad base, curved inwardly upon itself so that the sharp tip is directed posteriorly. Length: 3 mm.

Specimens examined: 1; Hennepin County; May 1, 1937.

Empoasca fabae (Harris)⁸

(Pl. VIII, Fig. 3, 3A)

Synonymy

There has been considerable uncertainty in the correct name for the potato leafhopper. The insect has been described as new at least eight times, principally because of its economic importance, great variability in color and markings, and wide range of host plants. In the older literature it is commonly recorded under several names which are synonyms, or has been confused with closely related species. Accordingly, it seems desirable to give a complete chronological summary of the synonymy of *Empoasca fabae* (Harris).

As far as can be ascertained, the insect was first described by Harris (1841, p. 186) as *Tettigonia fabae*. Fitch (1851, p. 63) listed it as *Erythroneura fabae* (Harris) and later it was assigned to the genus *Empoa* by Harris (1852, p. 199).

LeBaron (1853, p. 75) independently described the species as *Tettigonia mali*. Ball (1924) after examining Harris' types concluded that *mali* LeBaron was the same as *fabae* Harris.

The genera *Empoasca* and *Chloroneura* were erected by Walsh (1862, p. 149); he described as new *Empoasca viridescens*, *E. con-*

⁸ Much of the following which relates to *E. fabae* is taken from a thesis presented by the writer (1940) to the faculty of the Graduate School of the University of Minnesota as partial fulfillment of the degree of Doctor of Philosophy.

sobrina, and *Chloroneura malefica*. Walsh (1865) republished his earlier paper and noted that further evidence showed that *conso-brina* was only a variety of *viridescens*. Ball (1924) carefully reviewed the identity of Walsh's species and concluded all three were the same as *fabae* Harris.

Berg (1879, p. 273) described *Typhlocyba photophila* from Argentina. Gillette (1898) considered this species to be the same as his identifications of *mali* (LeBaron).

Forbes (1884, p. 181) described an apple pest as *Empoa albopicta* on the basis of Uhler's statement that it was an unknown species belonging to that genus. Later, Forbes (1886) noted that *albopicta* had been previously described as *mali* (LeBaron) but thought the earlier name should be ignored. Woodworth (1889, p. 213) placed *albopicta* in *Empoasca* along with the species earlier described by Harris and Walsh. Gillette (1891, p. 104) was the first to use the combination, *Empoasca mali*.

Gillette (1898) revised the group containing the genus *Empoasca*. He described *Empoasca pallida* as new from specimens preserved in alcohol. Gillette also referred certain color varieties of *E. mali* to *E. flavescens* (Fabricius). DeLong (1931) revised the genus *Empoasca* and found *pallida* in part the same as *fabae* and stated that *flavescens* is found only in Europe. Therefore, American references to this species by Gillette and following workers probably concern *fabae*, but this supposition cannot be correctly verified unless specimens have been preserved.

Ball (1924) first definitely established the insect's scientific name as *Empoasca fabae* (Harris) in economic literature. DeLong (1931) described the specific characters of the male internal genitalia so that accurate taxonomic identifications could be made.

Description

Empoasca fabae (Harris) is a small (3-3.5 mm.) pale green species with a bluntly angled crown a little longer on the middle than next to the eyes. Its markings are variable and many times its color is faded to yellowish in preserved specimens. Apex of crown with a pair of dark green spots, a median white line, and dashes to each side; pronotum with a row of six white spots along anterior margin, posteriorly with two white stripes which pass onto scutellum and are united by a bar to form a letter H; basal angles of scutellum whitened. The above markings may be distinct or obscure. Fore wing greenish hyaline, sometimes smoky iridescent at apex. In ventral view, lateral processes of pygofer

roundly broadened on the inner margin at about half their length, then rather abruptly curved to sharp-pointed caliperlike tips. Styles curving outward, crossing the lateral processes at their broadened part. In lateral view, dorsal spine broad, rather evenly narrowed to the ventrally directed tip.

Specimens examined: 58,703; all parts of the state. In some years it is present in destructive abundance on economically important crops, particularly apples, potatoes, and legumes.

Empoasca pallida Gillette

1898. *Empoasca pallida* Gillette. U. S. Natl. Mus. Proc. 20: 741.

1935. *Empoasca constricta* DeLong and Davidson. Ohio Jour. Sci. 35:31.

Pale green, sometimes faded to yellow. Lateral process straight and rodlike, indented before the apex. In ventral view, sloping so that the sharp tips are proximal. Dorsal spine with a broad base, abruptly narrowed, and curved anteriorly. Length: 3 mm.

Specimens examined: 1; Ramsey County.

Empoasca distracta DeLong and Caldwell

1934. *Empoasca distracta* DeLong and Caldwell. Ent. Soc. Amer. Ann. 27:607.

Greenish yellow, the fore wing greenish hyaline. Pronotum with three white spots on the anterior margin; crown mottled with white areas. In ventral view, styles heavy, curved outwardly at the apices, the lateral processes long, the tips slightly divergent. Dorsal spine broad and curved, the sharp point directed anteriorly. Length: 3 mm.

Specimens examined: 9; Hennepin County; April 30, 1938.

Empoasca curvatura Davidson and DeLong

1938. *Empoasca curvatura* Davidson and DeLong. Ohio Jour. Sci. 38:90.

Dull green, with white spots on crown and pronotum, and a broad longitudinal white stripe on scutellum. In ventral view, lateral processes directed inwardly, crossed at about two thirds their length, then curved back and overlapping near the apices. Dorsal spine with a curved point directed ventroanteriorly. Length: 3.2 mm.

Holotype male from Taylors Falls, August 16, 1916 (DeLong) is in DeLong collection, according to Davidson and DeLong (1938).

Empoasca erigeron DeLong

1931. *Empoasca erigeron* DeLong. U. S. Dept. Agr. Tech. Bul. 231:48.

A small green species resembling *fabae*; the crown more bluntly produced than *fabae*, but with similar markings. Lateral process of pygofer long and rodlike, curved dorsally, and very abruptly narrowed to a sharp-pointed tip. Dorsal spine directed ventrad, abruptly curved anteriorly near the tip. Length: 3 mm.

Specimens examined: 15; Hennepin, Dakota, Ramsey, Chisago, and Kanabec counties. The earliest recorded appearance of this species is during the last of April, when it is found on box elder.

Empoasca pergrada Davidson and DeLong

1938. *Empoasca pergrada* Davidson and DeLong. Ohio Jour. Sci. 38:93.

Yellowish green, the crown bluntly angled, one half of its length before anterior margins of eyes. Plates rounded and slightly divergent at apices. In ventral view, lateral processes thick, tips bluntly narrowed and bent obliquely inward. Dorsal spine broad at base, narrowed abruptly, the tip directed downwardly and anteriorly. Length: 3 mm.

Specimens examined: 7; Ramsey County (Pig's Eye Island), under bark of trees; February 9, 1935. According to Davidson and DeLong (1938), an *allotype* female and *paratype* males and females from Taylors Falls, August 16, 1916 (DeLong), are in the DeLong collection.

TYPHLOCYBA Germar

1833. Silbermann's Revue Entomologique 1:180.

GENOTYPE: *Cicada quercus* Fabricius, 1777. Subsequent designation.

Small, yellowish or white, usually without markings, sometimes with dark markings, only rarely with other colors. Crown angulate or bluntly produced. Fore wing lacking anteapical cells, without an appendix, the third apical cell appearing triangular, its margining veins pedicellate or sessile due to junction anteriorly (Pl. VIII, Fig. 8). Hind wing without a submarginal vein, with two apical cells.

McAtee (1926b) revised this genus and figured the male genitalia. New species have since been added by DeLong and Davidson (1934) and DeLong and Johnson (1936).

McAtee (1926b) divided the genus into three easily recognized groups and gave them numbers. The writer follows this division, but substitutes names for the numbers.

Key to Groups

1. Inner apical cell approximately triangular, the inner apical vein contiguous (or nearly so) with the cubitus (Pl. VIII, Fig. 8C) **danae** group
- Inner apical cell distinctly trapezoidal, the inner apical vein separated from the cubitus by a portion of the second cross vein.....2
2. Junction of outer cross veins and apical veins with margin of fore wing marked by a distinct dark spot (Pl. VIII, Fig. 8A) **ulmi** group
- Without such dark spots (Pl. VIII, Fig. 8B)..... **rosae** group

Ulmi group

The species of this group have dark clouds just anterior to the cross veins (Pl. VIII, Fig. 8A) in addition to the dark spots at the intersection of the apical veins and the margin of the fore wing. The male genitalia uniform throughout in the distinctly shouldered and definitely bristled plates, the styles with a tooth near the beginning of the apical bend, and the aedeagus three parted from the base. The posterior margin of sternite VII is usually more or less emarginate laterally.

Key to Species

1. Scutellum distinctly black..... **luculla**
- Without dark markings on scutellum..... 2
2. Aedeagus with two pairs of lateral appendages, the central shaft simply bifid at apex..... **unca**
- Aedeagus with one pair of lateral appendages, the central shaft with two pairs of apical processes..... **piscator**

Typhlocyba luculla n. sp.

(Pl. IX, Fig. 3)

Related to *T. piscator* McAtee in the general type of upcurved aedeagus, but differs in the form of the apical processes. Approaching *T. ulmi* Linn. in the dark markings, but with a different color pattern. Length: male, 3.25 mm.

Male: Head pale yellow, pronotum yellowish white. Scutellum entirely fuscous, the darkening from beneath visible along the posterior margin of the pronotum and through the wings at the sides of the scutellum. Dorsal portion of abdomen black, visible through the wings from above; underparts clear yellow to whitish. Fore wing whitish hyaline, distinctly marked with fuscous apically as follows: a band anterior to and covering the cross veins, narrowed to cover only the cross vein at the costal margin; first (inner) apical vein fuscous, the darkening enlarged to a distinct spot at the inner margin of wing; second and third apical veins fuscous including the fused petiole. The third or triangular cell is completely filled with fuscous. The dark markings are nearly all of the same intensity except for the junctions

of the apical veins with the wing margin, which are nearly black.

Genitalia: Plate wide basally, abruptly narrowed at about half its length to a narrow apex, forming a prominent shoulder. Lateral margin of plate with a stiff bristle at the base and several small bristles at the shoulder. Style long and slender, with a distinct tooth at the beginning of the apical curvature. In lateral view, base of aedeagus with a small elongate knob from which arise a convexly upcurved central shaft and a pair of slender processes. Lateral margins of central shaft appearing ribbed because of heavy sclerotization for about half its length, the ribs terminating in a pair of heavy bristles directed laterad at about right angles to the shaft. The inner, lighter portion of the central shaft continued for a short distance beyond the ribs, then divided into a pair of slender slightly divergent bristles which project beyond the capsule.

Female: Unknown.

Holotype: Male, Itasca County, July 26, 1939, light trap.

Paratypes: One male, Itasca County, July 29, 1939, light trap; one male, Itasca County, August 4, 1939, light trap; one male, Itasca County, August 6, 1939, light trap.

A mutilated male specimen, Itasca County, July 26, 1939, light trap, with the genitalia in a vial is included in the series. Figures of the internal genitalia were made from this specimen.

All types deposited in the University of Minnesota collection.

Typhlocyba piscator McAtee

1926. *Typhlocyba piscator* McAtee. U. S. Natl. Mus. Proc. 68:7.

Pale yellowish, immaculate, except for cloudiness in apical cells, and spots at distal ends of outer cross vein and apical veins. In lateral view, aedeagus with a long central shaft, directed dorsad, then curved downward, the tip with two pairs of curved, sharply pointed appendages, the ventral pair being longer. A long sinuous pair of processes arising from base of aedeagus reach almost to the ventral appendage of central shaft. Length: 3 mm.

Specimens examined: 6; Itasca County, St. Paul, and Ramsey County; July.

Typhlocyba unca McAtee

(Pl. VIII, Fig. 8A)

1926. *Typhlocyba unca* McAtee. U. S. Natl. Mus. Proc. 68:8.

Pale yellowish to whitish, marked as in *piscator*. Aedeagus in dorsal view with central, apically bifid shaft flanked by two

pairs of slender processes, the inner pair short and slightly bent laterally, the almost straight outer pair slender and longer than central shaft. In lateral view, the central shaft sharply curved ventrad near apex. Length: 3 mm.

Specimens examined: 13; Itasca County, Anoka County, on hazel, and Ramsey County; July to September.

Rosae group

This is the largest group and the situation is confused by the great number of color varieties of some species. Many species are recognized by markings, but a majority must be identified by internal male genital characters. The aedeagus in species of this group is seldom bifid and rarely caliperlike or trifold.

Key to Species

1. Fore wing with distinct, though sometimes not extensive, dark markings 2
Fore wing without dark markings 9
2. Commissure with a pronounced narrow black edging *phryne* var. *subpulchra*
Without such markings (*gillettei* and varieties) 3
3. Dark markings of fore wing limited to a well-defined band over the cross veins or smokiness in the apical cells 4
Fore wing more extensively marked 6
4. Fore wing whitish anterior to cross veins *apicata*
Fore wing colored otherwise 5
5. Fore wing yellowish anterior to cross veins *saffrana*
Fore wing reddish anterior to cross veins *russeola*
6. Fore wing with two well-defined cross bands 7
Fore wing more extensively darkened 8
7. Scutellum pale *casta*
Scutellum dark *gillettei*
8. Anterior half of fore wing dark *venusta*
All of fore wing dark *vestita*
9. Females 10
Males 14
10. Sternite VII distinctly emarginate laterally *modesta*
Sternite VII otherwise 11
11. Posterior margin of sternite VII distinctly pointed medially *rosae*
Sternite VII otherwise 12
12. Sternite VII produced medially, but not distinctly pointed, slightly emarginate laterally *pomaria*
Sternite VII almost evenly convex, sometimes slightly emarginate laterally 13
13. With a decidedly yellowish wash *froggatti*, *andromache*
Usually whitish, rarely yellowish *melite*, *candidula*
14. Pygofer with a heavily pigmented spine or tubercle at the posterior ventral angle; plates usually black apically 15
Pygofer without such a process; plates usually not black apically 17

15. Plates not black apically, process on pygofer developed as a sharp, heavily blackened spine, usually seen without dissection **pomaria**
Plates heavily pigmented apically.....16
16. In ventral view, outer shafts of aedeagus sharply angled outward near the apex.....**melite**
Outer shafts not angled near apex.....**andromache**
17. Posterior margin of pygofer developed into a dorsal spine and ventral tubercle.....**modesta**
Without posterior angles so developed.....18
18. Apex of aedeagus with two pairs of leaflike appendages.....**rosae**
Apex of aedeagus with slender antlerlike appendages.....19
19. Aedeagus with three pairs of apical processes.....**candidula**
Aedeagus with two pairs of apical processes.....**froggatti**

Typhlocyba rosae (Linnaeus)

1758. *Cicada Rosae* Linnaeus. *Systema Naturae*. Ed. 10, p. 439.

Whitish, sometimes yellowish, immaculate. Aedeagus of male directed dorsad, dilated along the curve, the tip with two pairs of leaflike appendages, the outer pair longer and stouter. Length: 3.5-3.75 mm.

Specimens examined: 48; Ramsey County, on apple and rose; September.

Typhlocyba froggatti Baker

1925. *Typhlocyba froggatti* Baker. *Philippine Jour. Sci.* 27: 537.

1926. *Typhlocyba xanthippe* McAtee. *U. S. Natl. Mus. Proc.* 68:14.

Light yellowish. Aedeagus directed dorsad, with two pairs of curved processes at the tip, the pair directed anteriorly being forked. Length: 3.5 mm.

Specimens examined: 1; Ramsey County.

Typhlocyba candidula Kirschbaum

1868. *Typhlocyba candidula* Kirschbaum. *Cicadinen Wiesbaden und Frankfurt*, p. 185.

Pale whitish, immaculate, the fore wing slightly iridescent apically. In lateral view, aedeagus with an upcurved shaft, terminated by two pairs of curved short prongs directed anteriorly and a more slender pair extended dorsad. Length: 3.5 mm.

Specimens examined: 2; Ramsey County.

Typhlocyba gillettei (Van Duzee)

1917. *Empoa querci* var. *gillettei* Van Duzee. *Cat. of Hemip.*, p. 708.

A typical specimen is whitish, sometimes with a yellowish tinge. Fore wing with two dusky cross bands, one across the

middle of the clavus and the other over the cross veins, the apical cells usually clouded. Scutellum usually black. Aedeagus in dorsal view with three pairs of characteristic intricate appendages; an inner pair bent near the middle so that the tips cross, an intermediate pair short and slender, and the outer long, sharp-pointed pair extending past the tips of inner pair. Length: 3.5-4 mm.

Specimens examined: 3,720; Lake, Ramsey, Cass, Polk, Olmsted, Winona, Goodhue, and Cook counties; June, July, and August. The principal host plant is *Quercus*.

McAtee (1926b, p. 28) records specimens from King Bluff, Winona County, June 30, 1922.

In addition to the typical specimens described above there are many color varieties. Some of these found in Minnesota are included in the key. They differ markedly in color and extent of markings, but all have the same pattern of male internal genitalia.

Typhlocyba gillettei var. *apicata* McAtee

1926. *Typhlocyba gillettei* var. *apicata* McAtee. U. S. Natl. Mus. Proc. 68:25.

Whitish ground color; immaculate except for a band over the cross veins and smokiness in apical cells. Length: 3.5 mm.

Specimens examined: 62; Lakeland and Ramsey County.

Typhlocyba gillettei var. *saffrana* McAtee

1926. *Typhlocyba gillettei* var. *saffrana* McAtee. U. S. Natl. Mus. Proc. 68:26.

Generally yellow to yellowish white; fore wing deep yellow anterior to a single dark band over cross veins.

Specimens examined: 1; Crookston; July 17, 1935.

Typhlocyba gillettei var. *russeola* McAtee

1926. *Typhlocyba gillettei* var. *russeola* McAtee. U. S. Natl. Mus. Proc. 68:26.

Yellowish on head and thorax; fore wing smoky-tinged, with dusky spots near cross veins in apical cells, the portion anterior to cross veins overlaid with reddish. Length: 3.5 mm.

Specimens examined: 1; Ramsey County.

Typhlocyba gillettei var. *casta* McAtee

1926. *Typhlocyba gillettei* var. *casta* McAtee. U. S. Natl. Mus. Proc. 68:26.

Pale whitish, more usually yellowish. Apical cells of fore wing smoky-tinged; fore wing with two dusky bands, one over

cross veins, the other crossing middle of clavus. The pale scutellum distinguishes this variety from the typical *gillettei*.

Specimens examined: 10,264; Lakeland, Crookston, Minnesota City, and Ramsey County; June to September.

Typhlocyba gillettei var. *venusta* McAtee

1926. *Typhlocyba gillettei* var. *venusta* McAtee. U. S. Natl. Mus. Proc. 68:29.

Ground color yellowish, with dusky brown overlying anterior half of fore wing and scutellum.

Specimens examined: 100; Crookston, Two Harbors (10 miles north), and Ramsey County; July and August.

Typhlocyba gillettei var. *vestita* McAtee

1926. *Typhlocyba gillettei* var. *vestita* McAtee. U. S. Natl. Mus. Proc. 68:29.

Golden yellow deeply overlaid with brown. Underparts yellowish as are the costal margins of fore wing.

Specimens examined: 15; Ramsey County.

Typhlocyba pomaria McAtee

(Pl. VIII, Fig. 8B)

1926. *Typhlocyba pomaria* McAtee. U. S. Natl. Mus. Proc. 68:29.

Pale yellowish, the front usually tinged with orange. Posterior edge of male pygofer with a sharply pointed black tooth directed ventrad, an easily recognized external character. In ventral view the aedeagus three-shafted, the middle shaft short, slightly notched, the lateral branches longer, and curved sharply outward near the tips. Length: 3.25-3.75 mm.

This species sometimes seriously injures apples in the eastern states. Garman (1934) gave notes on the life history and control. The specking on fruit caused by their excrement can be removed by an HCl wash according to Hough (1931).

Specimens examined: 572; Ramsey, Hennepin, Wabasha, Polk, Yellow Medicine, and Crow Wing counties; June and July. According to McAtee (1926b) paratypes of this species from Winona County, July 1, 1922 (P. B. Lawson), are in the Kansas University collection.

Typhlocyba andromache McAtee

1926. *Typhlocyba andromache* McAtee. U. S. Natl. Mus. Proc. 68:32.

Whitish, tinged with yellow. Aedeagus three-parted from the base, the lateral processes slightly divergent, longer than the

middle shaft which is shallowly bifid at apex. Length: 3.5 mm.

Specimens examined: 8; Itasca and Ramsey counties; July.

Typhlocyba melite McAtee

1926. *Typhlocyba melite* McAtee. U. S. Natl. Mus. Proc. 68: 32.

Whitish to pale yellow, sometimes dusky-tinged in apical cells of fore wing. Aedeagus three-pronged, the lateral processes right-angled outward near apex, the inner shaft sharply pointed, the tip bifid. In lateral view the shafts upcurved, thickened at the middle. Length: 3.5-4 mm.

Specimens examined: 11; Ramsey County.

Typhlocyba modesta Gibson

1917. *Typhlocyba modesta* Gibson. Canad. Ent. 49:184.

White, immaculate, sometimes yellowish, the apex of fore wing dusky-tinged. Aedeagus in lateral view showing two shafts, the lower one longer, upcurved, bifid at the apex, the upper one short, slightly upcurved to an acute apex. Length: 4 mm.

Specimens examined: 251; Ramsey County.

Typhlocyba phryne var. *subpulchra* McAtee

1926. *Typhlocyba phryne* var. *subpulchra* McAtee. U. S. Natl. Mus. Proc. 68:35.

Whitish, characteristically marked with black on the commissure, the black extending on to scutellum as a parenthesislike mark. Fore wing with black spots anterior to cross veins. Length: 3.75 mm.

Specimens examined: 3,174; St. Paul, Two Harbors (10 miles north), and Ramsey County; June to September.

Typhlocyba quadrata DeLong and Johnson

1936. *Typhlocyba quadrata* DeLong and Johnson. Ent. News 47:102.

Whitish yellow, immaculate, the apex of fore wing slightly smoky, the nervures lemon yellow; dark spots present anterior to cross veins of fore wing. Aedeagus in ventral view U-shaped from the base, the apices slender and directed inward, almost touching. Male pygofer with a sharp spine at the dorsal angle, another spine on posterior margin below, and a concavity between. Length: 3.75 mm.

Specimens examined: 1 male, Ramsey County (University Farm lights), July 8, 1921, is doubtfully placed here. Although the genitalia are similar in general pattern to the illustrations of

the holotype male, they seem to differ specifically with respect to the spines on the pygofer and the shape of the aedeagus.

Danae group

The fore wing has prominent dark spots anterior to the cross veins in addition to the triangular inner apical cell (Pl. VIII, Fig. 8C). A common feature is a caliperlike bifid aedeagus.

Key to Species

1. Dusky spots anterior to cross veins rather elongate, sometimes forming an ill-defined band.....*appendiculata*
Spots anterior to cross veins not elongate.....2
2. Each arm of aedeagus forked apically.....*berenice*
Each arm of aedeagus not forked apically.....*eurydice*

Typhlocyba appendiculata Malloch

(Pl. VIII, Fig. 8C)

1920. *Typhlocyba appendiculata* Malloch. Canad. Ent. 52:95.

Usually white, but sometimes yellowish-tinged. Apical cells of fore wing clouded, a broad dusky band anterior to cross veins, usually reduced to ill-defined spots. Sometimes the fore wing clouded with smokiness anterior to cross veins and on the clavus. In dorsal view male aedeagus Y-shaped, the base slender, the arms very stout, with long, slender, inwardly directed tips.

Specimens examined: 2,994; St. Paul and Ramsey County; June to September.

Typhlocyba eurydice McAtee

1926. *Typhlocyba eurydice* McAtee. U. S. Natl. Mus. Proc. 68:37.

Yellowish white, the fore wing with small dusky spots in front of cross veins and duskiess margining the apical cells. Aedeagus with a short stout base, from which arise two arms directed outwardly, then angled inwardly, the acute apices crossing and directed downwardly. Length: 3.25 mm.

Specimens examined: 1; Ramsey County.

Typhlocyba berenice McAtee

1926. *Typhlocyba berenice* McAtee. U. S. Natl. Mus. Proc. 68:38.

A yellowish-white species, immaculate, except for small smoky spots in front of cross veins and dusky clouding along margins of apical cells. Aedeagus with a short base from which two arms curve convexly to acutely forked tips projecting inwardly and downwardly. Length: 3.5 mm.

Specimens examined: 99; St. Paul and Ramsey County; June.

CICADELLA Dumeril

1806. Zoologie Analytique, pp. 266-267 and 334.

GENOTYPE: *Cicada vittata* Linnaeus, 1758. Subsequent designation.

Small, with conspicuous markings. The hind wing is without a submarginal vein and the four apical veins extend to the margin, forming three apical cells (Pl. VIII, Fig. 6A). Fore wing with the third apical cell triangular, pedicellate anteriorly, the outer apical vein turned rather sharply to the costal margin (Pl. VIII, Fig. 6).

Although *nigra* (Osb.) and *flavoscuta* (Gill.) have been reported from Wisconsin by Sanders and DeLong (1917), the writer has not found any species of this genus represented in the Minnesota collection. A key to species of this genus (as *Eupteryx*) was presented by McAtee (1919).

HYMETTA McAtee

1919. Biol. Soc. Wash. Proc. 32:121.

GENOTYPE: *Tettigonia trifasciata* Say, 1825. Original designation.

Head narrower than pronotum, the crown distinctly produced and roundly conical. Fore wing broad and only slightly narrowed apically, with four apical cells (Pl. VIII, Fig. 7). Apex of scutellum blackened and distinctly elevated.

Fairbairn (1928b) revised this genus and figured the male genitalia.

Hymetta trifasciata (Say)

(Pl. VIII, Fig. 7, 7A)

1825. *Tettigonia trifasciata* Say. Acad. Nat. Sci. Phila. Jour. 4:343. (Also: 1891. Compl. Writ. 2:259.)

Milky white, the fore wing with a dark band anteriorly, crossing the base of the clavus and narrowed at the costa; an additional indistinct band near the cross veins and at the apex. Numerous small red spots dot the fore wing especially near the cross veins (Pl. VIII, Fig. 7). Length: 3 mm.

Lateral processes of the aedeagus vary slightly from those figured by Fairbairn (1928b) but until a study of a larger series can be made it cannot be determined whether this difference is specific.

Specimens examined: 13; Houston, Chisago, Ramsey, Hennepin, Washington, Fillmore, Winona, Goodhue, and Dakota counties; May to October.

ERYTHRONEURA Fitch

1851. Homop. N. Y. State Cab. Nat. Hist., p. 62.

GENOTYPE: *Erythroneura tricincta* Fitch, 1851. Subsequent designation.

Small, beautifully ornamented species. Fore wing without an appendix, the third apical cell not triangular, and the inner apical vein extending to the wing tip (Pl. VIII, Fig. 9). Hind wing without a submarginal vein, with two apical cells.

Species of this genus are found on a wide variety of hosts. Apparently they all overwinter as adults, hibernating under dead leaves in sheltered places. Barber (1921) listed the species injuring woodbine and Johnson (1935) discussed the host plants of this group.

This genus is poorly represented in the Minnesota collection, probably on account of the small size and infrequent collection by ordinary sweeping methods. There is no doubt that more intensive collecting will add many new records for Minnesota.

The genus has been divided into well-defined groups based on wing venation. Six were used by McAtee (1920), five by Robinson (1926) and Johnson (1935), and four by Beamer (1936).

Key to Groups

1. M-Cu cross vein present (Pl. VIII, Fig. 9A, 9C)..... 2
 M-Cu cross vein apparently absent (Pl. VIII, Fig. 9B, 9D)..... 3
2. Base of inner apical cell curved (Pl. VIII, Fig. 9C); two posteriorly diverging vittae usually present on crown and pronotum *obliqua* group
 Base of inner apical cell angulate; cross veins usually white (Pl. VIII, Fig. 9A); crown and pronotum not as above..... *vulnerata* group
3. Base of inner apical cell oblique, usually with a black spot near cross vein (Pl. VIII, Fig. 9B)..... *maculata* group
 Base of inner apical cell square, apex of third apical cell with a black spot or fuscous cloud (Pl. VIII, Fig. 9D)..... *comes* group

Vulnerata group

Usually dark colored, with a light colored median vitta from crown to scutellum. Fore wing with M-Cu cross vein present; base of inner apical cell angulate; cross veins and frequently the contiguous longitudinal veins whitish (Pl. VIII, Fig. 9A).

Key to Species

1. Crown blunt, a pair of brown spots near posterior margin..... *lecta* var. *carbonata*
 Crown angular, dark except for thin light lines..... 2
2. Species olive brown..... *vulnerata*
 Species very dark brown to black..... *niger*

Erythroneura vulnerata Fitch

(Pl. VIII, Fig. 9A)

1851. *Erythroneura vulnerata* Fitch. Homop. N. Y. State Cab., p. 62. (Also: 1893. N. Y. State Ent. Rpt. 9:402.)

Olive brown, sometimes tinged with maroon. A light-colored median line from crown to scutellum, the crown with a light patch next to each eye; pronotum with spots to each side. Fore wing dark olive, with whitish spots on clavus, white cross veins, and yellowish costal plaque. Length: 3 mm.

This species is found commonly on grapes, but probably is seldom abundant enough to be economically important. Found also on *Clematis* spp. and *Ampelopsis* spp., particularly the Virginia creeper.

Specimens examined: 358; principally in the southern half of the state.

Erythroneura niger (Gillette)

1898. *Typhlocyba vulnerata* var. *niger* Gillette. U. S. Natl. Mus. Proc. 20:765.

Black, or dark brown, with a continuous white median line on crown, pronotum, and scutellum, sometimes reduced to spots. Fore wing with a whitish-yellow spot at base of clavus, the cross veins pale. Length: 2.75 mm.

Specimens examined: 127; Ramsey, Washington, and Hennepin counties; April to July.

Erythroneura tecta var. *carbonata* McAtee

1920. *Erythroneura tecta* var. *carbonata* McAtee. Amer. Ent. Soc. Trans. 46:289.

Dark, the crown yellow, bluntly produced, and with a pair of brown spots near the posterior margin. Pronotum brown-black, spotted with white on either side of a yellow median line which is continuous onto scutellum between the dark lateral angles. Fore wing hyaline, heavily overlaid with brown except for a yellow spot on anterior half of clavus and a white spot over cross veins. Length: 2.5 mm.

Specimens examined: 1; Ramsey County (near Grey Cloud Island); July 12, 1922.

Obliqua group

The group is characterized by the base of the inner apical cell having the M-Cu cross vein and a part of the cubitus joined to make a smoothly curving vein which obliquely meets the margin (Pl. VIII, Fig. 9C). The species are usually easily recognized by the oblique reddish vittae on the fore wing paralleling the

claval suture and (or) the inverted V-shaped mark on the crown which continues onto the pronotum as two stripes. The male internal genitalia are used entirely for the diagnosis of many species, particularly the pale-bodied forms. It has been found by Beamer (1930) that the aedeagus and posterior end of the styles are of diagnostic value.

Key to Species

1. Fore wing dusky, the markings covering most of surface.....2
Fore wing whitish, with narrow yellow or reddish oblique vittae.....4
2. Fore wing whitish, the longitudinal vittae fused to form a broad dorsal stripe*lawsoniana*
Fore wing smoky, overlaid with red vittae.....3
3. Two indefinite heart-shaped pale spots on the commissure.....*fumida*
No definite spots, evenly colored to the cross veins.....*kansa*
4. At least some dark on abdomen.....5
Body pale, sometimes tinged with reddish.....8
5. Scutellum with a black spot in basal angles.....*noevus*
Scutellum without a black spot.....6
6. Venter mostly light but somewhat darkened, vittae on pronotum faint*cuneata*
More darkly colored, the vittae prominent.....7
7. Inverted V of crown even-sided, enlarged near eyes and extending across pronotum as two enlarging, even-sided stripes.....*plena*
Inverted V of crown broadly touching the eyes; vittae on pronotum short, broad, and irregular.....*fulvocephala*
8. Shaft of aedeagus with processes bending at right angles near the tips*angularis*
Shaft of aedeagus with processes parallel.....9
9. Processes not over half the length of shaft of aedeagus.....*obliqua*
Processes reaching nearly to tip of shaft of aedeagus.....*unicuspis*

Erythroneura fumida (Gillette)

1898. *Typhlocyba obliqua* var. *fumida* Gillette. U. S. Natl. Mus. Proc. 20:758.

Darkly colored, the fore wing smoky and with three oblique red vittae; a heart-shaped white spot at base of scutellum and at tip of clavus.

Specimens examined: 6; Ramsey, Dakota, Chisago, and Goodhue counties; April to October.

Erythroneura kansa Robinson

1924. *Erythroneura kansa* Robinson. Canad. Ent. 56:58.

Crown with heavy maroon V-shaped vittae, widened next to the eyes. Pronotum dusky with a trace of red vittae continued from crown. Apex of scutellum tinged with red, the basal angles dark smoky. Fore wing smoky, with two dull vittae paralleling

the claval suture. Posterior point of style curved, a little longer than base of foot. Aedeagus long, with right-angled short processes at tip. Length: 3 mm.

Specimens examined: 5; Hennepin, Washington, and Ramsey counties; April to October. Two females, Chisago County, October 17, 1939, are placed here, although the fore wing is heavily washed with maroon anterior to the cross veins, and the vittae are obscured.

Erythroneura lawsoniana Baker

(Pl. II, Fig. 3)

1898. *Typhlocyba obliqua* var. *dorsalis* Gillette. U. S. Natl. Mus. Proc. 20:757.

1926. *Erythroneura lawsoniana* Baker. Philippine Jour. Sci. 30:347.

Pearly white, heavily overlaid with red or reddish orange, sometimes distinctly fumose. An inverted triangular red stripe from apex of crown across scutellum, widening on the fore wing to include all of clavus, except a small basal portion. Corium with a stripe from middle of costal plaque extending to cross veins.

A common apple species.

Specimens examined: 272; Ramsey and Fillmore counties; May to September.

Erythroneura cuneata Beamer

1930. *Erythroneura cuneata* Beamer. Ent. Soc. Amer. Ann. 23:433.

White, with lemon-yellow vittae; posterior point of style slender, as long as base of foot; aedeagus with a short, curved, wedge-shaped shaft, laterally flattened at tip.

Specimens examined: 1; Goodhue County; May 20, 1938.

Erythroneura fulvocephala Robinson

1924. *Erythroneura fulvocephala* Robinson. Canad. Ent. 56: 155.

Yellow vittae on white, the V-shaped vittae of crown enlarged near eyes. Anterior point of style almost right-angled; posterior point narrow and about two thirds the length of base of foot. Aedeagus in lateral view curved dorsally, with a pair of slender processes extending about half its length.

Specimens examined: 4; Ramsey and Washington counties; May to October.

Erythroneura noevus (Gillette)

1898. *Typhlocyba obliqua* var. *noevus* Gillette. U. S. Natl. Mus. Proc. 20:757.

Pearly white; an inverted V on crown touching eyes at margin, continued across pronotum as diverging vittae. Scutellum with a black spot in each basal angle, sometimes the adjoining parts smoky. Fore wing with oblique red vittae. Abdomen pearly white.

Specimens examined: 1; Olmsted County.

Erythroneura plena Beamer

(Pl. VIII, Fig. 9C)

1930. *Erythroneura plena* Beamer. Ent. Soc. Amer. Ann. 23: 442.

Yellowish white, the crown with an inverted orange or red V, even-sided, enlarged near eyes and continuing on pronotum. Usually with stripes on fore wing. Venter black. Style with base of foot straight, the anterior point sharp, the posterior point twice as broad, the inner margin at right angles with base. Aedeagus almost straight in lateral view with two processes arising just below the base curved slightly downward and back to the shaft.

McConnell (1931) reported on the stippling of peach leaves caused by this species and gave notes on its biology.

Specimens examined: 32; Ramsey County, on plum, Hennepin, Goodhue, and Washington counties; May to September.

Erythroneura angularis Beamer

1930. *Erythroneura angularis* Beamer. Ent. Soc. Amer. Ann. 23:447.

Pearly white, the crown with an inverted V which continues across pronotum. Usually three pairs of oblique vittae on fore wing. Aedeagus short, with a pair of processes arising at base, contiguous to shaft to about two thirds its length, then right-angled laterally.

Specimens examined: 6; Ramsey and Dakota counties; April to October.

Erythroneura obliqua (Say)

1825. *Tettigonia obliqua* Say. Acad. Nat. Sci. Phila. Jour. 4:342. (Also: 1891. Compl. Writ. 2:259.)

Yellowish white, the crown with an inverted V enlarged basally to touch the eyes, continuing across pronotum, scarcely reaching posterior margin. Fore wing with three pairs of oblique orange stripes. Venter stramineous. Aedeagus almost straight

in lateral view, with two inconspicuous processes arising at base and extending next to shaft for about half its length.

Specimens examined: 17; Hennepin, Chisago, Carlton, Washington, Ramsey, and Olmsted counties; early spring and late fall.

Erythroneura unicuspidis Beamer

1930. *Erythroneura unicuspidis* Beamer. Ent. Soc. Amer. Ann. 23:452.

White, the inverted V of crown widening and touching the eyes, and continuing across pronotum. Oblique orange stripe on fore wing, the apex somewhat dusky. Aedeagus heavy, almost straight, with two processes arising at base and touching dorsal side at tip.

Specimens examined: 11; Ramsey County, on box elder, Goodhue, Chisago, Olmsted, and Hennepin counties; May to October.

Maculata group

This group is apparently without the M-Cu cross vein, the base of the inner apical cell being angled and bearing a black spot (Pl. VIII, Fig. 9B). Some species are recognized by external characters, but the majority are identified only by characters of the internal male genitalia. Beamer (1931, 1932) reviewed the group and figured the genitalia of the species. He found that the posterior end of the styles and the pygofer hooks possess excellent diagnostic characters.

No economically important species are known in this large group, but many are found on deciduous trees and shrubs. Many of the writer's spring collections have been on *Ribes* spp.

Key to Species

1. Scutellum and most of pronotum smoky brown-black *kansana*
Species otherwise 2
2. Color pattern consisting of conspicuous red to smoky bands across the
clavus and corium, or of continuous red zigzag vittae 3
Color pattern chiefly of yellow to red spots (*maculata* complex
separated only by internal characters) 6
3. With zigzag vittae 4
With transverse markings 5
4. Head and pronotum with faint yellow markings, the tip of the clavus
immaculate *ligata*
Head and pronotum with red markings, the tip of clavus with a red
spot *ligata* var. *allecta*
5. A broad smoky-brown band covering scutellum and basal half of fore
wing *basilaris*
An irregular bright red saddle across fore wing *aesculi*
6. Pygofer hook double 7
Pygofer hook single 9

- | | |
|--|-----------------|
| 7. Inner branch of pygofer hook shorter than outer..... | <i>separata</i> |
| Two branches of pygofer hook of nearly equal length..... | 8 |
| 8. Inner branch of pygofer hook curved, the tips converging..... | <i>curvata</i> |
| Inner branch of pygofer hook not curved, the tips separated..... | <i>carmini</i> |
| 9. Pygofer hook with a sickle-shaped curve..... | 10 |
| Pygofer hook straight or but slightly curved..... | 12 |
| 10. Aedeagus straight, the pygofer hook nearly U-shaped..... | <i>externa</i> |
| Aedeagus beaklike or semicircular, the pygofer hook more broadly curved..... | 11 |
| 11. Posterior point of style about length of foot..... | <i>rostrata</i> |
| Posterior point of style much shorter than length of foot..... | <i>ballista</i> |
| 12. Style without a posterior point..... | <i>clavipes</i> |
| Style with a well-developed posterior point..... | 13 |
| 13. Pygofer hook with a slight but distinct S-curve..... | <i>bigemina</i> |
| Pygofer hook straight..... | 14 |
| 14. Posterior point of style more than half as long as foot; aedeagus with processes at tip..... | <i>maculata</i> |
| Posterior point of style less than half as long as foot, aedeagus without processes at tip..... | <i>campora</i> |

Erythroneura maculata (Gillette)

1898. *Typhlocyba comes* var. *maculata* Gillette. U. S. Natl. Mus. Proc. 20:764.

Pearly white, with cherry-red spots on crown, pronotum, and scutellum; fore wing with well-defined red markings on the clavus and corium, the cross veins reddish. Pygofer hook short and thick. Posterior point of style greater in length than base of foot, narrowed to a short point. Aedeagus broad at base, the tip narrowed and with a lateral barb about half as long as the shaft right-angled to each side.

Specimens examined: 3; Hennepin, Houston, and Ramsey counties; May and June.

Erythroneura curvata Beamer

1931. *Erythroneura curvata* Beamer. Canad. Ent. 63:132.

Yellowish white, with bright red or orange spots. Pygofer hook double, the inner branch thick and with an abrupt bend near the middle back to the tip. Style with posterior and anterior points short, almost absent.

Specimens examined: 176; Ramsey, Hennepin, Mille Lacs, Washington, and Dakota counties; April and May. According to Beamer (1931, p. 133) a paratype male of this species is from Ramsey County.

Erythroneura clavipes Beamer

1931. *Erythroneura clavipes* Beamer. Canad. Ent. 63:269.

Yellowish white with orange markings. Pygofer hook a

single heavy spine distinctly slightly curved inwardly. Style with practically no heel, nor anterior and posterior points. Aedeagus broad and sharply curved, tapering at the apex to a blunt point.

Specimens examined: 8; Goodhue County; May 20, 1938.

Erythroneura rostrata Beamer

1931. *Erythroneura rostrata* Beamer. Canad. Ent. 63:270.

Yellowish white with orange markings. Pygofer hook long and slender, with a sharp sickle-shaped bend. Style with the posterior point almost as long as the base, sharply pointed. Aedeagus thick, curved dorsally in the semblance of a carnivorous bird's beak.

Specimens examined: 42; Ramsey County, on plum; September.

Erythroneura externa Beamer

1931. *Erythroneura externa* Beamer. Canad. Ent. 63:289.

Yellowish white with red spots, which are sometimes faded; a median line of spots on crown, pronotum, scutellum, and near tip of clavus. Pygofer hook narrow, bent outward in a broad U-curve, the tip almost in line with the base. Style with base of foot curved, the anterior point short and acute, the posterior point very sharply pointed.

Specimens examined: 3; Ramsey County.

Erythroneura separata Beamer

1932. *Erythroneura separata* Beamer. Canad. Ent. 64:12.

Yellowish white with red or orange markings. Pygofer hook double, narrowly U-shaped, the inner portion not as long as the outer. Style with posterior point shorter than base, narrow, and sharpened. Aedeagus slightly curved near the tip.

Specimens examined: 1; Hennepin County; May 2, 1936.

Erythroneura aesculi Beamer

1932. *Erythroneura aesculi* Beamer. Canad. Ent. 64:46.

Pearly white, with a crimson cross band on fore wing filling basal half of clavus, offset posteriorly at claval suture and then continuing to costa. Cross veins broadly reddened, a black spot in inner apical cell. Length: 2.5 mm.

Specimens examined: 1; Houston County; May 23, 1937.

Erythroneura ballista Beamer

1932. *Erythroneura ballista* Beamer. Canad. Ent. 64:84.

Yellowish white marked with orange or sometimes yellow spots. Spots on fore wing tending to form a zigzag irregular-

sided vitta. Pygofer hook single, heavy at base, sharply curved and sickle-shaped. Aedeagus characteristically bent into a semi-circle on apical half.

Specimens examined: 21; Ramsey County.

Erythroneura kansana Baker

1898. *Typhlocyba comes* var. *scutelleris* Gillette. U. S. Natl. Mus. Proc. 20:764.

1925. *Erythroneura kansana* Baker. Philippine Jour. Sci. 27: 537.

Crown light yellow, sometimes reddish; pronotum yellow with reddish markings anteriorly, a smoky brownish band on posterior border and on scutellum. Fore wing whitish with three red spots on clavus, the cross veins reddish.

Specimens examined: 8; Hennepin County, on *Rumex*, Chisago and Ramsey counties; April to October.

Erythroneura ligata McAtee

1920. *Erythroneura ligata* McAtee. Amer. Ent. Soc. Trans. 46:301.

Ivory white; crown with yellowish spots, three on the margin with front, and four between the eyes. Pronotum with two broad lateral and two narrower dorsal yellowish vittae, which may be broken into spots. Fore wing with a broad zigzag scarlet vitta, enclosing two pale saddle spots.

Specimens examined: 59; Ramsey County; May to September.

Erythroneura ligata var. *allecta* McAtee

1920. *Erythroneura ligata* var. *allecta* McAtee. Amer. Ent. Soc. Trans. 46:302.

Similar to *ligata*, but the yellow markings of crown, pronotum, and scutellum replaced by red.

Specimens examined: 2; Ramsey County.

Erythroneura carmini Beamer

(Pl. VIII, Fig. 9B)

1929. *Erythroneura carmini* Beamer. Ent. Soc. Amer. Ann. 22:121.

Yellowish white with red spots which are sometimes faded to orange. Pygofer hook double, narrowly V-shaped, the inner point about the length of the outer. Style with the foot almost lacking the anterior and posterior points.

Specimens examined: 199; Hennepin, Fillmore, Washington, Dakota, and Olmsted counties; April to August.

Erythroneura campora Robinson

1924. *Erythroneura campora* Robinson. Canad. Ent. 56:59.

Yellowish white with orange spots which are sometimes yellowish. Pygofer hook single, spearlike, about as long as pygofer, curved slightly inward. Style with posterior point sharply pointed, about half as long as the straight base.

Specimens examined: 190; Washington, Dakota, Hennepin, Ramsey, Clearwater, Chisago, Houston, and Lake counties; principally in the spring or late fall.

Erythroneura basilaris (Say)

1825. *Tettigonia basilaris* Say. Acad. Nat. Sci. Phila. Jour. 4:344. (Also: 1891. Compl. Writ. 2:260.)

Yellowish white, marked with orange or reddish brown. Fore wing with basal two thirds reddish brown or faded orange; variable spots on apical half, the cross veins reddish; a black spot at base of cell M_4 .

A common Minnesota species easily recognized by its characteristic markings.

Specimens examined: 776; Ramsey County, on plum and *Caragana*, Hennepin, Washington, Dakota, and Mille Lacs counties; April to October.

Erythroneura bigemina McAtee

1920. *Erythroneura maculata* var. *bigemina* McAtee. Amer. Ent. Soc. Trans. 46:300.

Yellowish white, marked with red spots, the spots on fore wing tending to give a zigzag appearance. Pygofer hook single, slightly longer than pygofer, slightly S-curved. Style with posterior point about half the length of the foot and right-angled to it.

Specimens examined: 1,104; Ramsey, Hennepin, Houston, Washington, Fillmore, and Olmsted counties; early spring or late fall.

Comes group

A group easily recognized by the square base of the inner apical cell (M-Cu absent). The inner cross vein is continuous with the second cross vein and meets the margin at about a right angle. Usually there is a dark area at the base of the inner apical cell and a distinct spot at the apex of the third apical cell (Pl. VIII, Fig. 9D). The internal male genitalia are characterized by diagnostic U-shaped pygofer hook, with arms directed caudally.

The group varies widely in color pattern, but usually the species have an inverted U-shaped vitta on the crown and a

median Y-shaped mark on the pronotum, flanked by an additional vitta behind each eye. Common hosts are *Vitis* spp., *Ampelopsis* spp., and *Cornus* spp., a number of the species feeding on grape being economically important. Fairbairn (1928a) gave a typical life history of a species in this group. Beamer (1936) reviewed the group and figured the male genitalia.

Key to Species

1. Species appearing transversely banded.....2
Species not appearing transversely banded.....4
2. Bands narrow, blackish, not covering base of fore wing.....**tricincta**
Bands broad, reddish; anterior cross band covering base of fore wing 3
3. Bands distinct**vitis**
Bands joined by red streaks, with a circle of white spots
between**vitis** var. **corona**
4. Crown with a red longitudinal median vitta.....5
Crown unicolorous or without a dark median vitta.....6
5. Median vitta narrow, with lateral vittae present.....**ontari**
Median vitta brown, consisting of two narrow vittae roughly
fused**kanwakae**
6. Fore wing with the angulate vittae not continuous from base to cross
veins7
Vittae continuous8
7. Species light, the median portion of clavus with a dark
spot**delicata** var. **accepta**
Species reddish, the dorsal vittae very broad**rubra**
8. Apex of clavus immaculate or very pale.....9
Apex of clavus with a definite colored spot.....10
9. Vittae of fore wing narrow, bright red or orange.....**acuticephala**
Vittae of fore wing broad, brownish red, greatly broadened between
the costal plaques.....**elegans**
10. Basal angles of scutellum with conspicuous black spots **coloradoensis**
Basal angles of scutellum without definite black spots.....11
11. Vittae of fore wing dark brown or black.....12
Vittae of fore wing lighter in color.....13
12. Vittae overlaid with velvety black.....**palimpsesta**
Vittae brownish throughout.....**ziczac** var. **walshi**
13. Crown with distinct vitta; dorsum with scarcely any dark
coloring**vitifex**
Crown without definite markings; dorsum distinctly dark-colored.....14
14. Markings of crown enclosing three round white dots; basal angles of
scutellum dark**caetra**
Markings of crown not enclosing three round white dots; basal angles
of scutellum orange.....**reflecta**

Erythroneura vitis (Harris)

(Pl. VIII, Fig. 9D)

1831. *Tettigonia vitis* Harris. *Encyclopedia Americana* 8:43.

Yellowish white; fore wing smoky at apex with two bright red transverse bands, one at the base and the other at the middle.

Crown with a pair of reddish arcs, in the semblance of an inverted V. Pronotum reddish, with more or less extensive paler markings.

A common species which is frequently reported on grape.

Specimens examined: 347; southern half of Minnesota.

Erythroneura vitis var. *corona* McAtee

1920. *Erythroneura vitis* var. *corona* McAtee. Amer. Ent. Soc. Trans. 46:304.

Similar to *vitis*, but with the middle band enlarged, and with red lines connecting it with the anterior cross band so that the saddle mark appears to be encircled with a ring of white spots.

Specimens examined: 55; St. Paul, on grape, Lakeland Junction, and Washington, Goodhue, Dakota, and Ramsey counties; April to July.

Erythroneura tricincta Fitch

1851. *Erythroneura tricincta* Fitch. Homop. N. Y. State Cab., p. 63. (Also: 1893. N. Y. State Ent. Rpt. 9:403.)

Pale yellow, distinctly marked with three blackish-red bands, the anterior cross band covering nearly all of pronotum and base of scutellum, the middle band over fore wing and blackened near costa, and the third band over the smoky apex. Sometimes reddish streaks are faintly present between the bands.

Specimens examined: 30; Goodhue, Hennepin, Washington, Houston, Dakota, and Ramsey counties, and Lakeland Junction; April and May.

Erythroneura acuticephala Robinson

1924. *Erythroneura acuticephala* Robinson. Canad. Ent. 56: 61.

Crown pointed, yellowish white, with a slender light-red U-shaped vitta. Fore wing with uniform vittae from the base to the cross veins, without a spot in the apex of the clavus. Resembling *kanwakae* but differs by the absence of most of the dark markings on the abdomen.

Specimens examined: 7; Chisago, Dakota, Goodhue, Hennepin, and Ramsey counties; April to October.

Erythroneura elegans McAtee

1920. *Erythroneura comes* var. *elegans* McAtee. Amer. Ent. Soc. Trans. 46:315.

Yellowish white with a reddish-orange vitta on crown and pronotum. Fore wing with vittae broadened across middle of clavus, a large black patch at end of costal plaque, the tip of

clavus unmarked, cross veins red, and apical cells infuscated.

Specimens examined: 171; Goodhue, Washington, Ramsey, Olmsted, Houston, Winona, Hennepin, and Anoka counties.

Erythroneura ziczac var. *walshi* Beamer

1936. *Erythroneura ziczac* var. *walshi* Beamer. Kans. Univ. Sci. Bul. 24:276.

Yellowish white, with dusky-red markings. A zigzag stripe along fore wing from the base to cross veins and a red spot at apex of clavus. Resembling *ziczac* Walsh, but without coloring on posterior two thirds of pronotum and with narrower vittae.

A common species frequently found on grape and Virginia creeper and at times abundant enough to damage seriously Virginia creeper (Pepper and Mills, 1936; Strand, 1937).

Specimens examined: 317; southern part of the state.

Erythroneura coloradoensis (Gillette)

1892. *Typhlocyba vitifex* var. *Coloradoensis* Gillette. Colo. Expt. Sta. Bul. 19:16.

Yellowish white, with orange markings. Scutellum with basal angles black; fore wing with a spot at base and tip, the angulate vittae orange, arising near the costal plaque and running obliquely to the cross veins.

Specimens examined: 2; Washington County, May 7, 1938; and Kawishiwi River, August 30, 1919.

Erythroneura palimpsesta McAtee

1924. *Erythroneura comes* var. *palimpsesta* McAtee. Ill. Nat. Hist. Survey Bul. 15:43.

Yellowish white, the markings of crown and pronotum orange yellow. Fore wing with a prominent brown-black vitta running from near the scutellum inside the claval suture; on the anterior half of the clavus this vitta is obliquely angled to the costa and back to the cross veins, forming a disc-shaped light spot, and then curved to apex of the fore wing. Length: 3 mm.

Specimens examined: 1; Goodhue County; May 20, 1938.

Erythroneura kanwakae Robinson

1924. *Erythroneura kanwakae* Robinson. Canad. Ent. 56:292.

Crown ivory white, with a bright red median stripe formed by two narrow fused vittae; fore wing white, with red stripes extending two thirds the length of the clavus, a spot at tip of clavus, and a line arising from the costal plaque which extends to the cross veins.

Specimens examined: 6; Ramsey County; September.

Erythroneura vitifex Fitch

(Pl. II, Fig. 2)

1856. *Erythroneura Vitifex* Fitch. N. Y. Agr. Soc. Trans. 16: 392.

Yellowish white marked with orange on crown, pronotum, and scutellum. Fore wing with broad zigzag vittae from base to cross vein, and a red spot in center of clavus.

Commonly recorded on grape.

Specimens examined: 1,730; southern part of the state.

Erythroneura caetra McAtee1924. *Erythroneura ligata* var. *caetra* McAtee. Biol. Soc. Wash. Proc. 37:133.

Yellowish white, with reddish markings, no definite marking on crown, but the latter may be indefinitely shaded. Clavus with a large basal mark, tinged with pink at the tip; oblique vittae from the plaque to the cross vein.

Specimens examined: 1; Carlton County; May 20, 1911. Reported to be a willow species by Beamer (1936).

Erythroneura reflecta McAtee1924. *Erythroneura comes* var. *reflecta* McAtee. Ill. Nat. Hist. Survey Bul. 15:43.

Pale, yellowish white, with red markings of varying intensity on the fore wing; basal angles of scutellum orange. Apex of fore wing dusky; oblique vittae extending from base of fore wing, touching at middle of clavus, obliquely angling to the costa and back to the reddened cross veins, forming a diamond-shaped spot nearly filled by a red spot at apex of clavus. Length: 3 mm.

Specimens examined: 4; Goodhue County, May 20, 1938; and Houston County, May 21, 1938.

Erythroneura delicata var. *accepta* McAtee1920. *Erythroneura comes* var. *accepta* McAtee. Amer. Ent. Soc. Trans. 46:317.

Milky white, with delicate pink vittae on fore wing, pronotum, and crown. A distinct dark mark in the orange spot near middle of clavus.

Specimens examined: 166; Washington, Houston, Fillmore, Hennepin, Ramsey counties; St. Paul, on grape; May to July.

Erythroneura ontari Robinson1924. *Erythroneura ontari* Robinson. Canad. Ent. 56:60.

Crown yellow, with a narrow median and a pair of lateral red vittae, continued on the grayish-white pronotum as a Y-shaped median vitta with a streak to each side. Fore wing grayish white,

subhyaline, broadly streaked with red on clavus; a broad red stripe on corium and red streaks between the costal plaque and cross veins; apex smoky.

Specimens examined: 13; Ramsey, Fillmore, Hennepin, and Chisago counties; April to October.

Erythroneura rubra (Gillette)

1898. *Typhlocyba comes* var. *rubra* Gillette. U. S. Natl. Mus. Proc. 20:764.

A reddish- or scarlet-marked species with broad vittae on the grayish fore wing, especially heavy along the costal margins, the apex usually smoky. The median longitudinal line of crown light-colored.

Specimens examined: 10; Houston and Ramsey counties; May to October.

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PLATES

PLATE I

EXTERNAL MORPHOLOGY OF *Chlorotettix unicolor* (Fitch)

- Fig. 1. Dorsal aspect of body.
- Fig. 2. Cephalic aspect of head (Face).
- Fig. 3. Ventral aspect of terminal abdominal segments of male.
- Fig. 4. Ventral aspect of terminal abdominal segments of female.
- Fig. 5. Hind wing.
- Fig. 6. Principal veins and cells of fore wing.

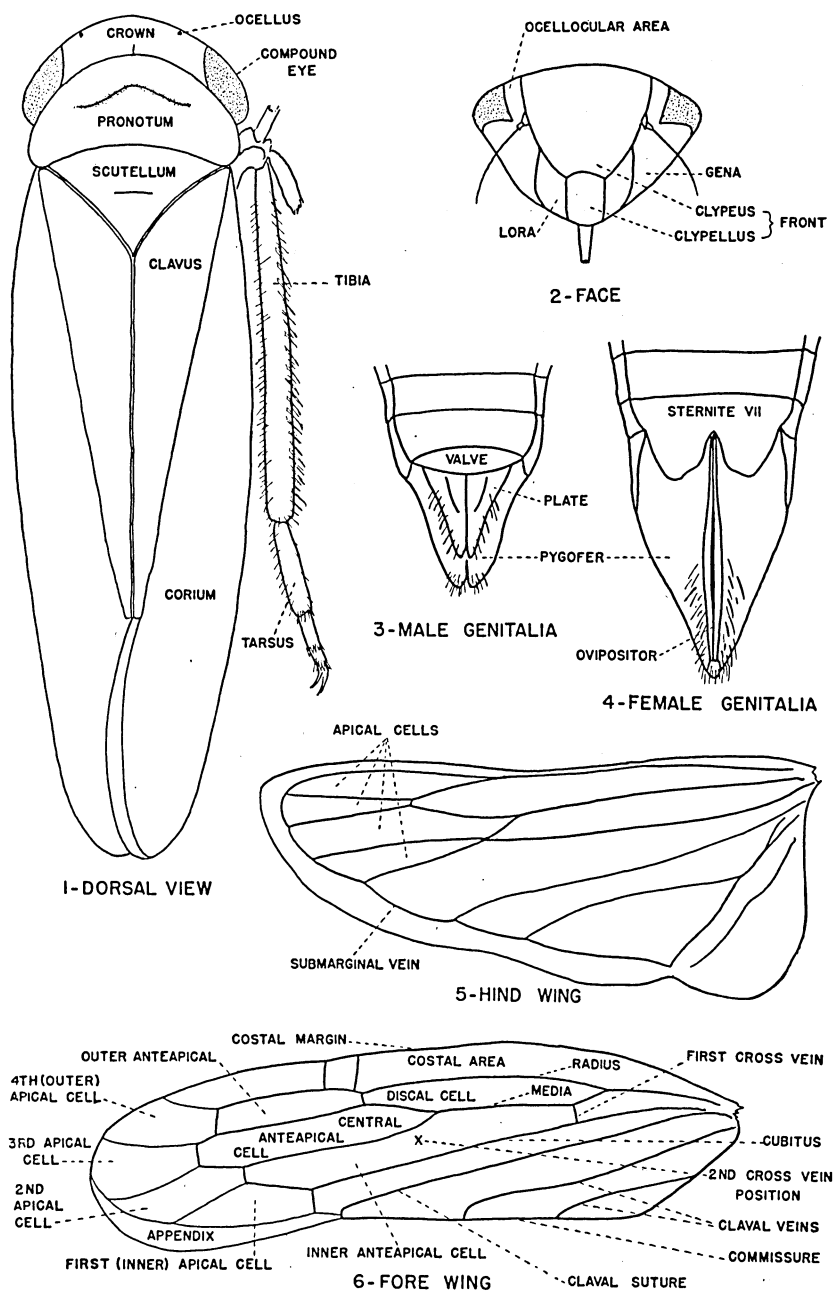
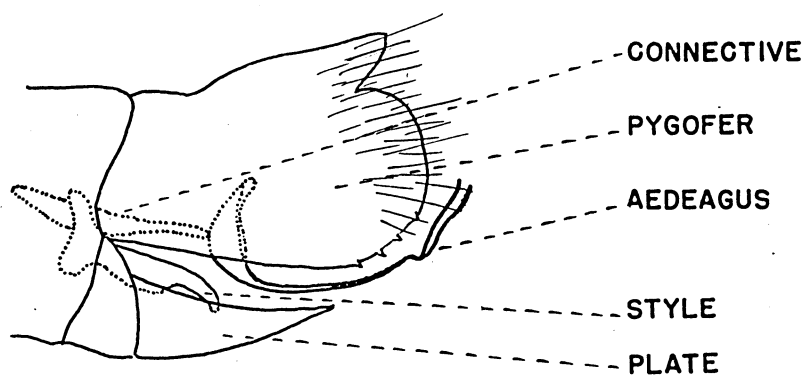


PLATE I

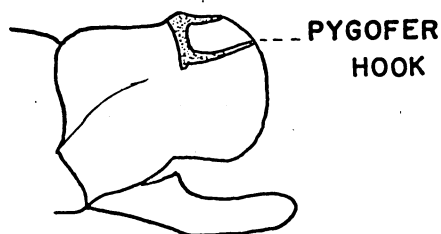
PLATE II

INTERNAL MALE GENITAL STRUCTURES OF *Chlorotettix* AND *Erythroneura*

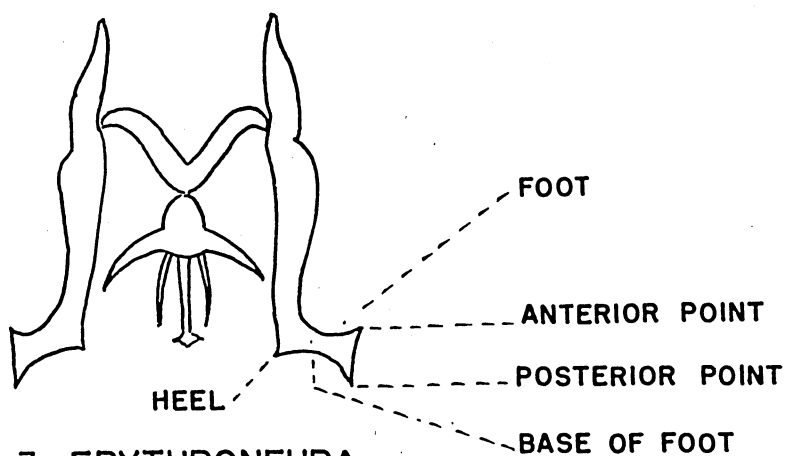
- Fig. 1. Lateral aspect of terminal abdominal segments of *Chlorotettix unicolor* (Fitch).
- Fig. 2. Pygofer hook; lateral aspect of terminal abdominal segment of *Erythroneura vittifex* Fitch.
- Fig. 3. Dorsoventral aspect of internal structures of *Erythroneura lawsoniana* Baker.



1 - CHLOROTETTIX



2 - ERYTHRONEURA



3 - ERYTHRONEURA

PLATE III

DORSAL ASPECT OF HEAD AND THORAX OF VARIOUS SUBFAMILIES OF LEAFHOPPERS

EURYMELINAE

- Fig. 1. *Idiocerus pallidus* Fitch.

BYTHOSCOPIINAE

- Fig. 2. *Stragania apicalis* (Osborn and Ball).
Fig. 2a. Profile of *Stragania apicalis* (Osborn and Ball).

AGALLIINAE

- Fig. 3. *Agallia 4-punctata* (Provancher).
Fig. 4. *Agalliopsis novella* (Say).
Fig. 5. *Aceratagallia sanguinolenta* (Provancher).

MACROPSINAE

- Fig. 6. *Macropsis trivialis* (Ball).
Fig. 7. *Oncopsis distinctus* (Van Duzee).

APHRODINAE

- Fig. 8. *Aphrodes albifrons* (Linnaeus).

AMBLYCEPHALINAE

- Fig. 9. *Graphocephala coccinea* (Forster).
Fig. 9a. Profile of *Graphocephala coccinea* (Forster).
Fig. 10. *Draeculacephala minor* (Walker).

JASSINAE

- Fig. 11. *Jassus olitorius* (Say).

GYPONINAE

- Fig. 12. *Gyponana striata* (Burmeister).

BALCLUTHINAE

- Fig. 13. *Balclutha impicta* (Van Duzee).
Fig. 14. *Nesosteles neglectus* (DeLong and Davidson).

EVACANTHINAE

- Fig. 15. *Evacanthus acuminatus* (Fabricius).

DORYDIINAE

- Fig. 16. *Parabolocratrus viridis* (Uhler).

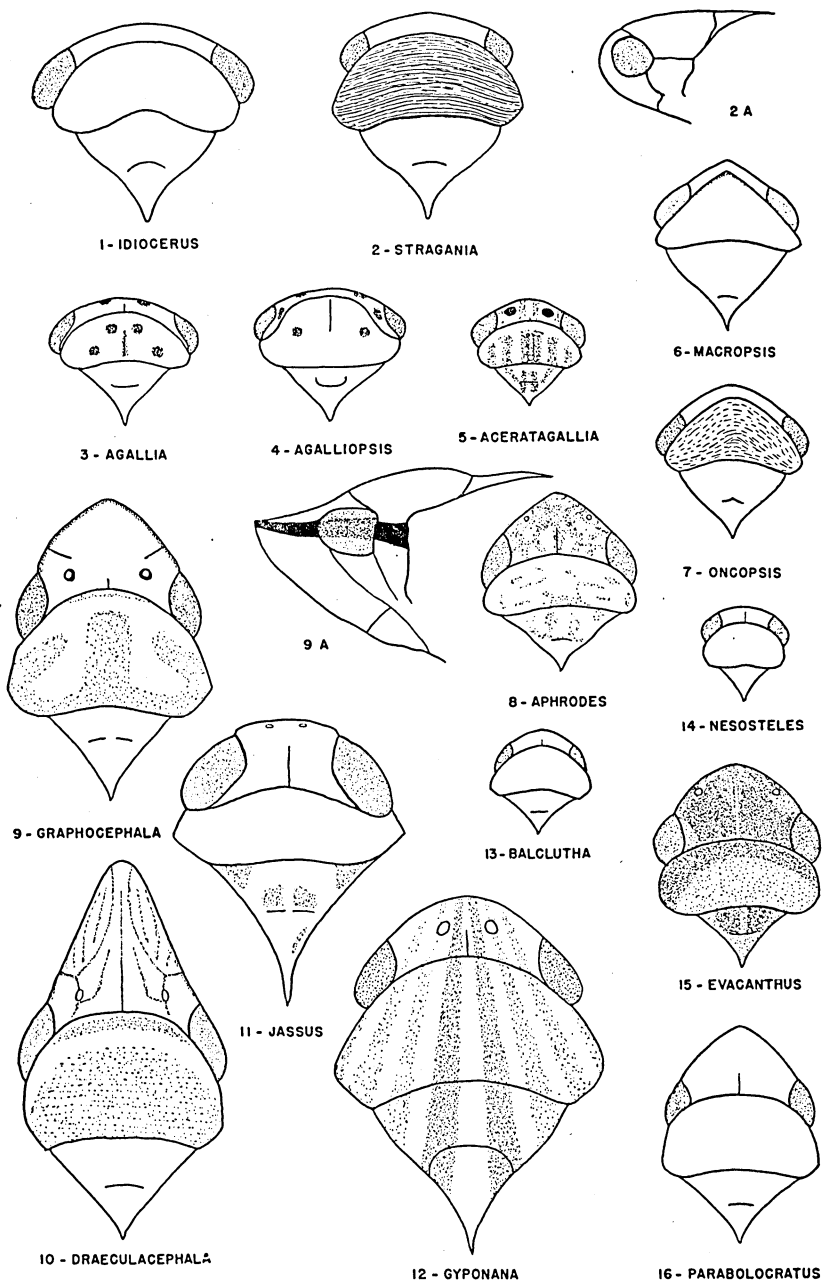
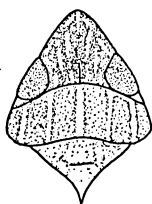


PLATE III

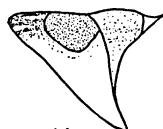
PLATE IV

DORSAL ASPECT OF THE HEAD AND THORAX OF VARIOUS GENERA OF THE
SUBFAMILY ATHYSANINAE

- Fig. 1. *Scaphytopius acutus* (Say).
Fig. 1a. Profile of *Scaphytopius acutus* (Say).
Fig. 2. *Scaphoideus pullus* DeLong and Mohr.
Fig. 2a. Profile of *Scaphoideus pullus* DeLong and Mohr.
Fig. 3. *Latalus missellus* (Ball).
Fig. 4. *Amplicephalus osborni* (Van Duzee).
Fig. 5. *Hebecephalus rostratus* Beamer and Tuthill.
Fig. 6. *Flexamia abbreviata* (Osborn and Ball).
Fig. 7. *Polyamia inimica* (Say).
Fig. 7a. Profile of *Polyamia inimica* (Say).
Fig. 8. *Laevicephalus affinis* (Gillette and Baker).
Fig. 8a. Profile of *Laevicephalus affinis* (Gillette and Baker).
Fig. 9. *Dellocephalus balli* Van Duzee.
Fig. 10. *Norvellina seminuda* (Say).
Fig. 11. *Menosoma cincta* (Osborn and Ball).
Fig. 12. *Graminella nigrifrons* (Forbes).
Fig. 13. *Phlepsius irroratus* (Say).
Fig. 14. *Paraphlepsius humidus* (Van Duzee).



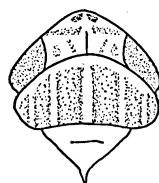
1- SCAPHYTOPIUS



1 A



3- LATALUS



4- AMPLICEPHALUS



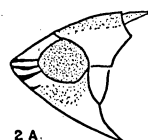
5- HEBECEPHALUS



6- FLEXAMIA



2- SCAPHOIDEUS



2 A



7- POLYAMIA



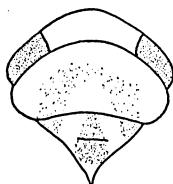
7 A



8- LAEVICEPHALUS



8 A



10- NORVELLINA



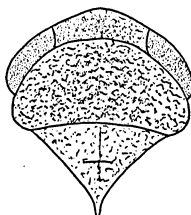
11- MENOSOMA



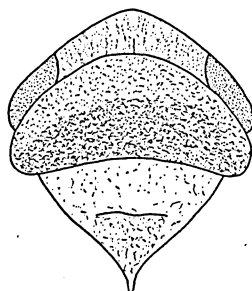
12- GRAMINELLA



9- DELTOCEPHALUS



13- PHEPSIUS



14- PARAPHEPSIUS

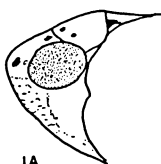
PLATE V

DORSAL ASPECT OF THE HEAD AND THORAX OF VARIOUS GENERA OF THE
SUBFAMILY ATHYSANINAE

- Fig. 1. *Exitianus obscurinervis* (Stål).
Fig. 1a. Profile of *Exitianus obscurinervis* (Stål).
Fig. 2. *Ophiola striatula* (Fallén).
Fig. 3. *Limotettix striolus* (Fallén).
Fig. 4. *Commellus comma* (Van Duzee).
Fig. 5. *Euscelis extrusus* (Van Duzee).
Fig. 6. *Amblysellus curtisii* (Fitch).
Fig. 7. *Opsius stactogalus* Fieber.
Fig. 8. *Bandara johnsoni* (Van Duzee).
Fig. 9. *Eutettix tenellus* (Baker).
Fig. 10. *Eutettix querci* Gillette and Baker.
Fig. 10a. Profile of *Eutettix querci* Gillette and Baker.
Fig. 11. *Aligia atrivena* Hepner.
Fig. 11a. Profile of *Aligia atrivena* Hepner.
Fig. 12. *Mesamia nigradorsum* Ball.
Fig. 13. *Colladonus clitellarius* (Say).
Fig. 14. *Idiodonus kennicotti* (Uhler).
Fig. 15. *Macrosteles divisus* (Uhler).
Fig. 16. *Macrosteles (Davisonia) major* (Dorst).



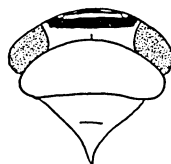
1 - EXITIANUS



1A



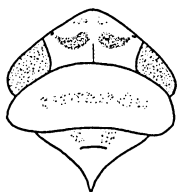
2 - OPHIOLA



3 - LIMOTETTIX



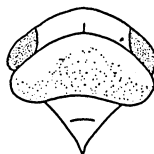
4 - COMELLUS



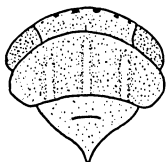
5 - EUSCELIS



6 - AMBLYSELLUS



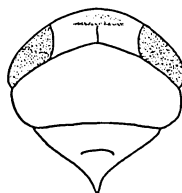
7 - OPSIUS



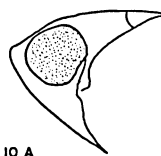
8 - BANDARA



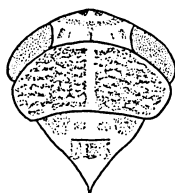
9 - E. TENELLUS



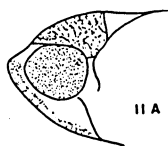
10 - EUTETTIX



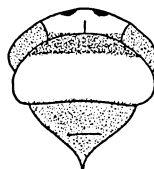
10 A



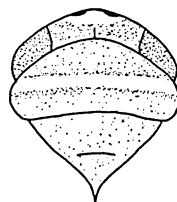
11 - ALIGIA



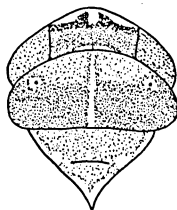
11 A



13 - COLLADONUS



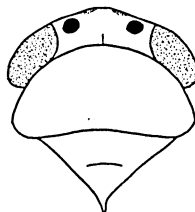
14 - IDIODONUS



12 - MESAMIA



15 - MACROSTELES

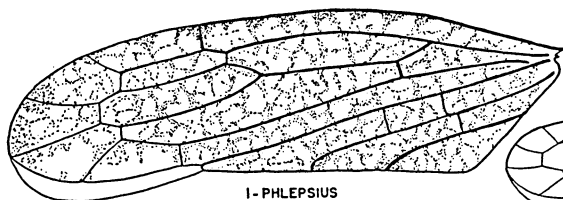


16 - MACROSTELES
SUBG. DAVISONIA

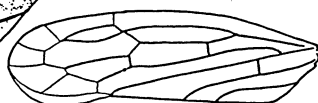
PLATE VI

VENATION OF FORE WINGS OF VARIOUS GENERA OF THE SUBFAMILY ATHYSANINAE

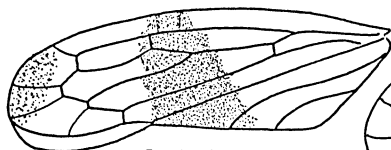
- Fig. 1. *Phlepsius irroratus* (Say).
Fig. 2. *Laevicephalus affinis* (Gillette and Baker).
Fig. 3. *Norvellina seminuda* (Say).
Fig. 4. *Bandara johnsoni* (Van Duzee).
Fig. 5. *Balclutha impicta* (Van Duzee).
Fig. 6. *Exiltianus obscurinervis* (Stål).
Fig. 7. *Platymetopius vitellinus* (Fitch).
Fig. 8. *Macrosteles divisus* (Uhler).
Fig. 9. *Eutettix tenellus* (Baker).
Fig. 10. *Menosoma cincta* (Osborn and Ball).
Fig. 11. *Cicadula cyperacea* (Osborn).
Fig. 12. *Nesosteles neglectus* (DeLong and Davidson).



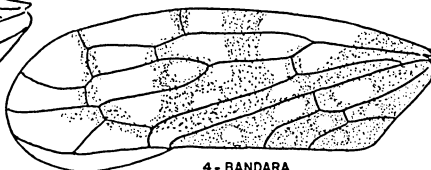
1 - PHLEPSIUS



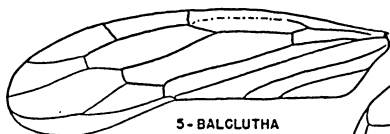
2 - LAEVICEPHALUS



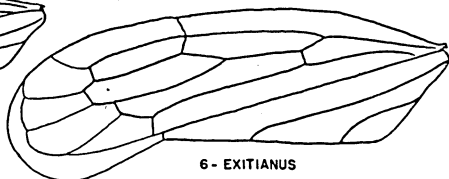
3 - NORVELLINA



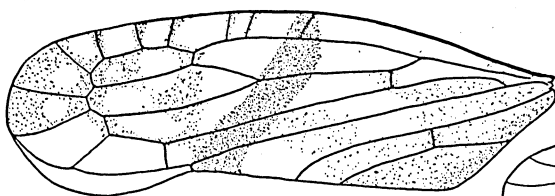
4 - BANDARA



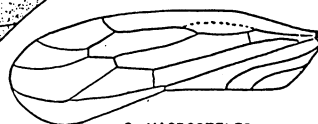
5 - BALCLUTHA



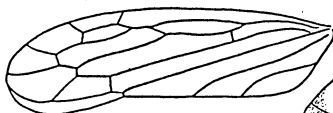
6 - EXITIANUS



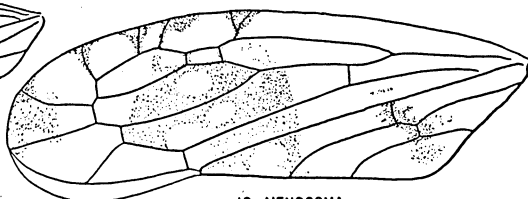
7 - PLATYMETOPIUS



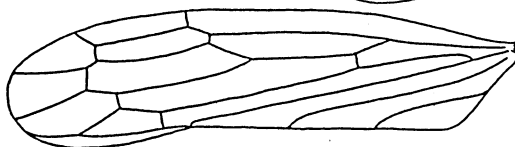
8 - MACROSTELLES



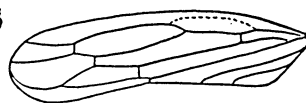
9 - EUTETTIX



10 - MENOSOMA



11 - CICADULA

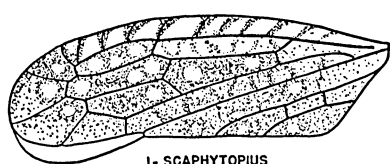


12 - NESOSTELES

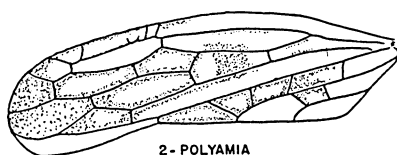
PLATE VII

VENATION OF FORE WINGS OF VARIOUS GENERA OF THE SUBFAMILY ATHYSANINAE

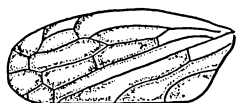
- Fig. 1. *Scaphytopius acutus* (Say).
- Fig. 2. *Polyamia inimica* (Say).
- Fig. 3. *Flexamia abbreviata* (Osborn and Ball).
- Fig. 4. *Osbornellus auronitens* (Provancher).
- Fig. 5. *Scaphoideus pullus* DeLong and Mohr.
- Fig. 6. *Graminella nigrifrons* (Forbes).
- Fig. 7. *Prescottia lobata* (Van Duzee).
- Fig. 8. *Aligia atrivena* Hepner.
- Fig. 9. *Palus marginatus* (DeLong).
- Fig. 10. *Lonatura rotunda* Beamer.
- Fig. 11. *Mesamia nigradorsum* Ball.
- Fig. 12. *Eutettix querci* Gillette and Baker.
- Fig. 13. *Latalus missellus* (Ball).



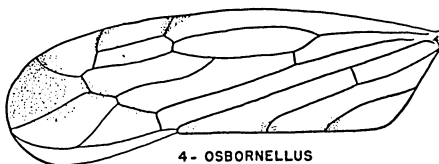
1 - SCAPHYTOPIUS



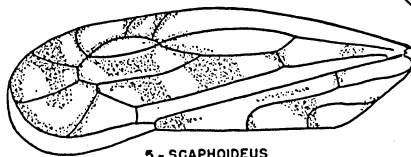
2 - POLYAMIA



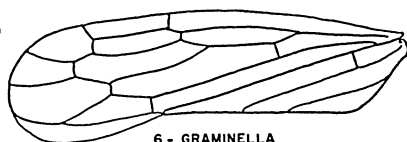
3 - FLEXAMIA



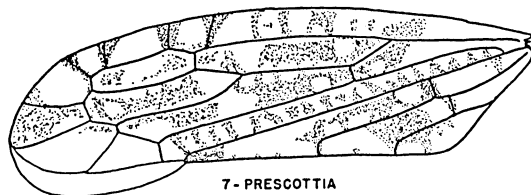
4 - OSBORNELLUS



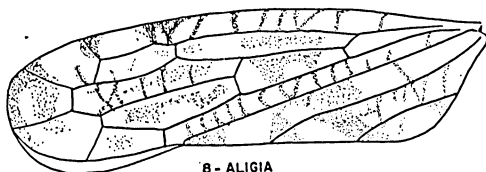
5 - SCAPHOIDEUS



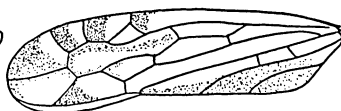
6 - GRAMINELLA



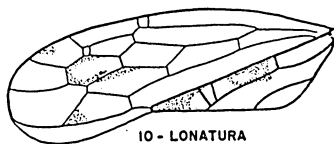
7 - PRESCOTTIA



8 - ALIGIA



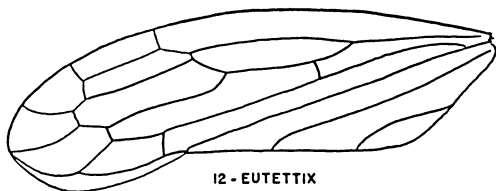
9 - PALUS



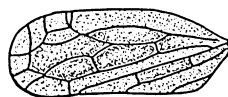
10 - LONATURA



11 - MESAMIA



12 - EUTETTIX

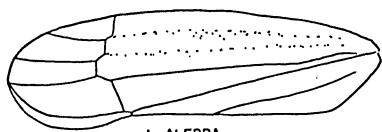


13 - LATALUS

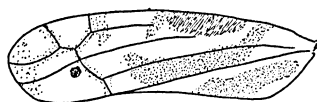
PLATE VIII

VENATION OF WINGS OF VARIOUS GENERA OF THE SUBFAMILY CICADELLINAE

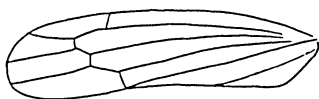
- Fig. 1. Fore wing of *Alebra albostrigella* var. *pallidula* (Walsh).
Fig. 2. Fore wing of *Alconeura rotundata* Ball and DeLong.
Fig. 3. Fore wing of *Empoasca fabae* (Harris).
Fig. 3a. Hind wing of *Empoasca fabae* (Harris).
Fig. 4. Fore wing of *Dikraneura mali* (Provancher).
Fig. 5. Fore wing of *Forcipata loca* DeLong and Caldwell.
Fig. 5a. Hind wing of *Forcipata loca* DeLong and Caldwell.
Fig. 6. Fore wing of *Cicadella flavoscuta* (Gillette).
Fig. 6a. Hind wing of *Cicadella flavoscuta* (Gillette).
Fig. 7. Fore wing of *Hymetta trifasciata* (Say).
Fig. 7a. Hind wing of *Hymetta trifasciata* (Say).
Fig. 8a. Fore wing of *Typhlocyba unca* McAtee (*ulmi* group).
Fig. 8b. Fore wing of *Typhlocyba pomaria* McAtee (*rosae* group).
Fig. 8c. Fore wing of *Typhlocyba appendiculata* Malloch (*danae* group).
Fig. 9a. Fore wing of *Erythroneura vulnerata* Fitch (*vulnerata* group).
Fig. 9b. Fore wing of *Erythroneura carmini* Beamer (*maculata* group).
Fig. 9c. Fore wing of *Erythroneura plena* Beamer (*obliqua* group).
Fig. 9d. Fore wing of *Erythroneura vitis* (Harris) (*comes* group).



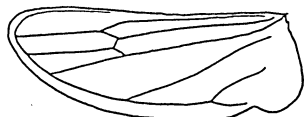
1 - ALEBRA



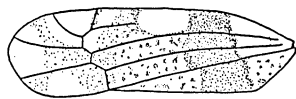
2 - ALCONEURA



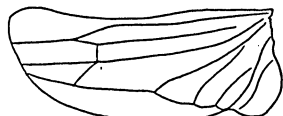
5 - FORCIPATA



5 A



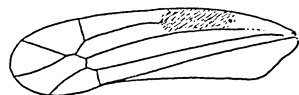
7 - HYMETTA



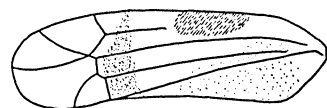
7 A



8 A

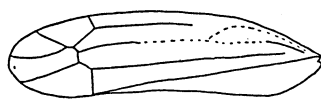


8 B

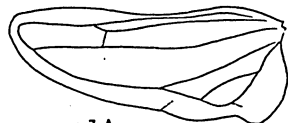


8 C

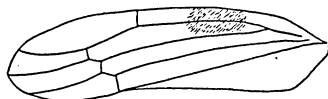
8 - TYPHLOCYBA



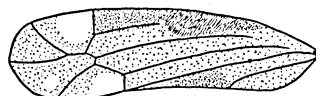
3 - EMPOASCA



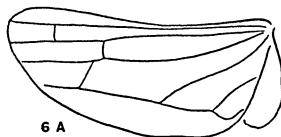
3 A



4 - DIKRANEURA



6 - CICADELLA

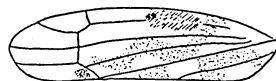


6 A



9 A

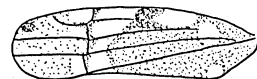
M - CU



9 B



9 C



9 D

9 - ERYTHRONEURA

PLATE IX

NEW SPECIES OF LEAFHOPPERS

Norvellina novica n. sp.

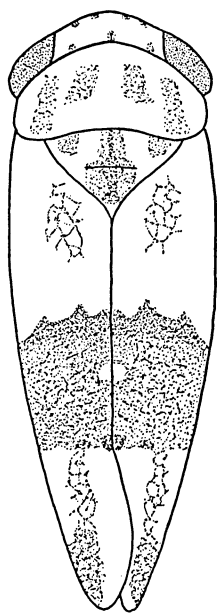
- Fig. 1. Dorsal aspect of female.
- Fig. 1a. Ventral aspect of terminal abdominal segments of male.
- Fig. 1b. Ventral aspect of terminal abdominal segments of female.
- Fig. 1c. Lateral aspect of male pygofer.
- Fig. 1d. Lateral aspect of posterior process of aedeagus.

Limotettix nigrax n. sp.

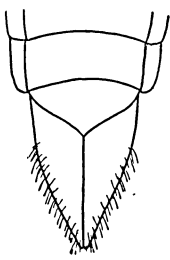
- Fig. 2. Dorsal aspect of male.
- Fig. 2a. Ventral aspect of terminal abdominal segments of male.
- Fig. 2b. Ventral aspect of terminal abdominal segments of female.
- Fig. 2c. Lateral aspect of male pygofer.
- Fig. 2d. Lateral aspect of posterior process of aedeagus.

Typhlocyba luculla n. sp.

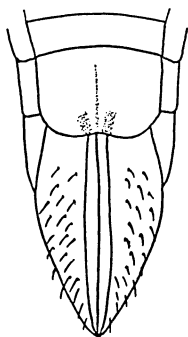
- Fig. 3. Dorsal aspect of male.
- Fig. 3a. Dorsoventral aspect of aedeagus.
- Fig. 3b. Lateral aspect of aedeagus.
- Fig. 3c. Male style.



1 - NOVICA ♀



1 A



1 B



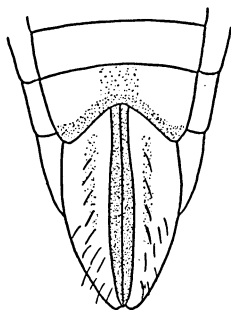
1 D



1 C



3 - LUCULLA ♂



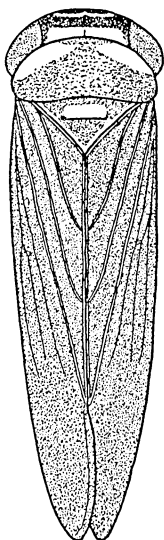
2 B



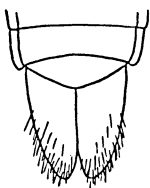
3 C



3 A



2 - NIGRAX ♂



2 A



2 C



2 B



2 D

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